BULLETIN OF THE

TAYLOR SOCIETY

AN INTERNATIONAL SOCIETY TO PROMOTE THE SCIENCE
AND THE ART OF ADMINISTRATION AND OF MANAGEMENT

The Investment Banker and Scientific Management

Time Study a Tool of Management

Education for Management

The Executive and Psychology

Engineering Societies Building
29 W. Thirty-Ninth St.
New York

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APRIL, 1928 VOL. XIII, NO. 2

Objects of the Taylor Society Incorporated

The objects of this Society are, through research, discussion, publication and other appropriate means:

1. To secure—for the common benefit of the community, the worker, the manager and the employer—understanding and intelligent direction of the principles of administration and management which govern organized effort for accomplishing industrial and other social purposes.

2. To secure the gradual elimination of unnecessary effort and of unduly burdensome toil in the accomplishment of the work of the world.

3. To promote the scientific study and teaching of the principles governing organized effort, and of the mechanisms of their adaptation and application under varying and changing conditions.

4. To promote general recognition of the fact that the evaluation and application of these principles and mechanisms are the mutual concern of the community, the worker, the manager and the employer.

5. To inspire in labor, manager and employer a constant adherence to the highest ethical conception of their individual and collective responsibility.

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The membership of the Society comprises Members, Junior Members, Honorary Members, Life Members, Firm Members, Contributing Members and Student Associates. Application for membership should be made on a regular form which may be secured from the Society. New members may be elected directly to the grades marked*.

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BULLETIN OF THE
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Volume I, Number 6 (1915)
Volume V, Number 6 (1920)
Volume XI, Numbers 1, 2, and 3 (1926)
Volume XII, Number 4 (1927)

Comment

EVIDENCE that the program of the BULLETIN during the past ten years has not been without value is to be found in the increasing frequency of references to its articles in current industrial literature. A recent book which has come to our attention, Rexford Guy Tugwell's excellent little volume, "Industry's Coming of Age," is full of such references, and we confess an increment of pleasure added on that account to the pleasure derived from the substance and treatment of the book.

AS PART of its winter program the New York Metropolitan Section, under Henry Bruere's guidance, has held three meetings on the subject of the banker's interest in scientific management. We regret that, because two of them were presented without manuscripts and were not stenographically reported, we are unable to publish all of the addresses. However, Mr. Walker's paper, printed in this issue, is noteworthy on its own account and is a fair sample of the series. The Metropolitan Section is deserving of congratulations for taking up a subject of such importance. The managements of many industrial enterprises get their cues from the bankers who provide capital, and the bankers are therefore in a position of great social responsibility with respect to the nature of their influence.

THE INFORMING address on time study by Colonel Thompson brought up a subject in which there is increasing interest because time study measurements establish a more precise basis for production control and wage rates. One session at the December Meeting was not sufficient for adequate consideration of it. That is why all the sessions of the May meeting in Detroit, of which the program is printed on another page, are to be devoted to the same subject. Dean Ruggles' paper is a thoughtful discussion of an unsolved problem—how schools of engineering and schools of commerce may better co-ordinate their work in the teaching of management. Mr. Hull's article should be suggestive to both executives and psychologists who are interested in the promotion of joint efforts to increase our knowledge in the field of industrial psychology.

What Interest Has the Investment Banker in Scientific Management?[1]

One of a Series of Addresses on the Inter-relation of Finance and Scientific Management

By Q. FOREST WALKER
Economist and Investment Banker, R. H. Macy & Co., Inc.

IN OUR appraisal of economic development, we are accustomed to measure achievement in material units or in dollars. We translate the abstract into the concrete for the simple reason that there is no other known method of expressing in understandable terms the contributions which systems of thought have made to our civilization. We make theory and philosophy realistic by setting forth their tangible results. We are deluged with a never ending stream of statistics. We shuffle through the maze of figures of car loadings, ton miles, building contracts, unfilled orders, iron and steel production, bank clearings, business failures, cotton consumption, farm crops, gross sales, net earnings, imports, exports and what not, with hardly a thought of the tremendous drama of industry and trade which they portray. All too often we are unmindful of the tortuous struggles of the thinkers who have evolved the principles and formulated the systems under which modern industry functions. Without the science and the art of administration and management, this material conquest would have been an idle dream. The soul of industry lies in the character and capacity of its leadership; its future rests on the intelligent development and application of sound principles of management.

The investor in corporate securities must in large measure pin his hopes on honest, efficient and progressive management. Probably, no other single factor in risk taking is as important. In many types of business, it represents more than three-fourths of the investment risk. Statistical evaluation of this factor is difficult and subject to much possibility of error, but the Bradstreet compilation of the causes of business failures illustrates its significance. This agency classifies these causes of failure into two broad groups: Class A—Due to the Faults of Those Failing; Class B—Not Due to the Faults of Those Failing. In the first group we find: incompetence (irrespective of other causes), inexperience (without other incompetence), lack of capital, unwise credits, speculation (outside of regular business), neglect of business (due to doubtful habits), personal extravagance and fraudulent disposition of property. The second group includes: specific conditions (disaster, war, floods, etc.), failures of others (of apparently solvent debtors) and competition. The percentages of failures due to personal and non-personal causes for the period of 1918-27 were as follows:

Year	Class A	Class B
1918	86%	14%
1919	86	14
1920	83	17
1921	75	25
1922	77	23
1923	81	19
1924	81	19
1925	82	18
1926	80	20
1927	82	18

Although more than ninety per cent of these failures are those of small businesses, the figures nevertheless show the preponderant importance of personal causes. In the larger businesses, management is generally better, but there have been enough serious failures due to poor management to establish the general accuracy of this conclusion.

Inefficient management not only produces insolvency, but it also accounts for a large part of the enormous deficits of corporate enterprise. Here, again, our statistics leave much to be desired, but the income tax returns of corporations afford food for thought. Certain data for the period 1916-1924 are presented on the next page.

Obviously both profits and losses may arise out of economic accidents, but in the worst years for particular industries, one finds hundreds of corporations showing net incomes and much larger numbers showing deficits. In the light of what we

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[1] Paper presented at a meeting of the New York Metropolitan Section of the Taylor Society, New York, March 15, 1928.

Year	Corporations Reporting Net Income		Corporations Reporting No Net Income	
	% of Total Number	Amount of Net Income ($000,000)	% of Total Number	Amount of Deficit ($000,000)
1916	61%	$8,766	39%	$657
1917	66	10,730	34	630
1918	64	8,362	36	690
1919	65	9,411	35	996
1920	59	7,903	41	2,029
1921	48	4,336	52	3,878
1922	56	6,964	44	2,194
1923	58	8,322	42	2,013
1924	57	7,587	43	2,224

know about the wide variations of percentages earned upon invested capital and the striking differences in the ability of managements, the figures suggest that there is ample room for the broader and more thorough application of the principles of scientific management.

Since Taylor's famous testimony in 1912, the true meaning of the term "scientific management" has become better known. Into the investment business has gone a large number of young men trained by engineering schools in the principles of the new business philosophy. There is no longer the same old confusion of thought on this subject: the failure to differentiate between the instruments of the system and the system itself. There is a better understanding of the need of the scientific spirit in industry, of that "mental revolution" essential to competitive survival. The investment banker has come to know the truth of Taylor's dictum "—that when the principles of scientific management have been applied in the correct way in any particular occupation or industry the results must, inevitably, in all cases, be far greater and better than they could possibly be under the best of the older types of management—."[2] He cannot question the soundness of the philosophy; he is most concerned with the problem of appraising the intelligence of its application and its effectiveness in producing profitable results. His problem can probably be best presented by a brief discussion of the purpose and scope of his field survey before undertaking a piece of financing.

Practically all of the larger investment banking houses maintain staffs of skilled investigators, for the purpose of making detailed field examinations of various financing proposals which are offered for their consideration. Many companies have such a high credit rating that field examinations are often considered unnecessary. For instance, bankers are willing to undertake financing of companies like the United States Steel Corporation, General Electric Company, and Standard Oil Company of New Jersey without the exhaustive field surveys. In the great majority of cases, however, the careful banker sends out skilled experts to study all the aspects of the company's operations. It is his aim to gather all the accounting, engineering, economic and legal facts which may be necessary to form a sound judgment of the character of the risk. In some cases all of this work is done by his own staff and in other instances, the accounting and engineering phases may be covered by independent organizations specializing in such examinations. The sound appraisal of investment risk is an infinitely complex problem requiring keen analytical study and shrewd judgment of personalities.

The fundamental objectives in these field surveys are to determine: (1) the economic merit of the industry, (2) the position of the particular company in the industry, (3) the character, condition and suitability of its physical facilities, (4) the efficiency of operation, (5) the past financial results, (6) the future possibilities, and (7) the character and capacity of management. Such information affords the basis of judgment as to the nature of the investment risk, the need and kind of financing which should be undertaken. "Rule-of-thumb" financing is disappearing: it has no place in modern finance. The scientific spirit in industry has its counterpart in investment banking. Few people realize the elaborate technique which the reputable investment banker has developed to solve these problems.

It is imperative for him to know a great deal about the economic characteristics of industrial groups. From the census and other statistics we obtain data regarding the growth and financial position of the industry. We study the products of the industry; the grades, standards, styles; the extent of standardization; the utilization of by-products and their importance. It is necessary to devote much attention to raw material problems, such as sources of production, extent of reserve supplies in the case of natural resources, the position of present and potential substitutes, the price fluctuations and their influence upon profits, methods of purchase, tariffs and other political restrictions. There are also broad tendencies in plant design, mechanical equipment and power use which cannot be overlooked. There are often labor problems of special importance. Processes of manufacture may be controlled through patents and trade secrets or may be undergoing significant changes. From the records of physical and value production, we can study seasonal and cyclical fluctuations which often tell the financial hazard more clearly than balance sheets and income accounts. There are also important questions of economic location, of trends toward integration, of marketing methods and possibilities. In some industries, it is feasible to make comparative financial studies for the purpose of establishing typical or standard financial relationships. Many industries through their associations are sponsoring improved accounting and managerial methods, the growing importance of which the investment banker can not afford to ignore. The individualistic company which contributes nothing to the general uplift of the industry and disregards the opportunities for co-operative advancement is seldom the best financial risk. Too often it is left behind in the procession.

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[2] *Bulletin of the Taylor Society*, Vol. XI, No. 3 and 4, June-August, 1926, p. 110.

The next step is to determine the position of the particular company in the industrial group. We must know its life history—its inception and development. We appraise its comparative position with respect to growth in volume and value of sales, plant capacity, ratio of production to capacity, control of raw materials, patents and processes, quality of product, public and trade opinion, general efficiency of organization and profitability of operation. These and other factors throw light on the relative position of the company in the industry, but more exhaustive analysis is, of course, essential to determine the reasons for the company's present and probable future competitive position. Within our allotted time we can do no more than to sketch the barest outlines of this further investigation.

It is necessary to make an economic study of the individual company. We must consider questions of location, physical equipment, raw materials, labor, finished products and their marketing. Our problem is to analyze the hazard present in various aspects of these factors. Obviously, favorable location with respect to raw materials, labor, power, and markets for finished products is always important. Proper physical equipment is likewise necessary. We examine the character of construction, age and general condition of factory buildings. We devote similar attention to mechanical equipment. We study plant lay-out to determine its suitability for efficient manufacturing. We want to know all about the company's methods of buying raw materials. If it is a company exploiting natural resources, we must consider the adequacy of reserves. Questions of labor supply, turnover, wage systems, welfare work, unionization and related matters must be carefully weighed. We must know a great deal about the finished products of the company, such as efforts toward standardization and simplification, fluctuations of production, character of demand, marketing methods and other features. In short, we must unearth every important detail which will aid in forming a sound opinion of the economic merit of the enterprise.

We may then pass to the problems of financial analysis. We must examine the income accounts over a period of several years, through prosperity and through depression. We are interested in the growth of sales, their seasonal and cyclical fluctuations. We must analyze the cost of sales, particularly the changes in the proportions of labor, raw materials and overhead. The movement of both gross profit and net income is similarly important. We cannot neglect the question of disposition of net income, the proportions paid in dividends and reinvested in the property. Comparative study of balance sheets is also necessary. Current assets and current liabilities, plant accounts and depreciation reserves, investment accounts, intangible items, funded debt, and capital accounts, surplus and other accounts must be subjected to searching examination.

We have said that management is the most important factor in investment risk. Throughout all of this elaborate investigation, we have been gathering material upon which to base our opinion of the character and ability of management. If there is lack of judgment in plant location and lay-out, that fact cannot escape the skilled investigator. If there is inadequate and careless maintenance, it is equally evident. If there are slip-shod purchasing methods, they become apparent. If there are archaic labor policies, it does not take long to spot them. There is probably not a single important phase of production, marketing, accounting and finance which is not appraised in the light of accepted standards of good management. It cannot be otherwise. The reputable investment banker must protect the interest of his customers. Management is his greatest risk. He is not oblivious to the scientific spirit in industry. He has had long experience; he knows that the unscientific and inefficient management is foredoomed to failure in a scientific age. He is vitally interested in every movement which aims to mitigate the hazard of investment.

For these reasons the management of the company under investigation must be studied with great care. We must delve into the company's methods of administration and the character of the organization. In the better companies we expect to find logical division of operations, rational delegation of authority and responsibility, and proper co-ordination of executive effort. The field examiner cannot depend upon the formal picture presented by the organization chart. By skillful observation and cross-questioning of executives in charge of both major and minor operations, he must check performance with theory. He often finds faulty division of operations, diffusion of responsibility and serious lack of co-ordination. It is important to obtain a great deal of information about the company executives. Education, business experience, loyalty and personality must be ascertained. There is much truth in the statement that an institution is the lengthened shadow of a man. There is no particular harm in an organization of this type if the ideals, methods and principles of the dominating personality at the head of the business are sound. There is always danger, however, that the dominating chief executive may build an organization in which initiative and creative thinking are not encouraged. The investor's capital is always safest in the company where managerial policy permits a continuing flow of ideas from many minds and provides for an impartial appraisal of their value. Good management often makes an inadequately equipped company in a business of more than usual risks worthy of investment financing.

No matter how exhaustive the banker's field investigation may be, there is always danger of error. The sound analysis of the risk in a given enterprise is a problem of infinite complexity. It is seldom possible to segregate the variables of managerial skill and economic conditions with any degree of precision. The best we can do, is to make what seems to be an intelligent guess. The competency of management cannot be judged solely upon the basis of net profit earned. Business profits often arise out of transitory economic causes. Favorable economic conditions or economic accidents may make it possible for a mediocre management to show good profits over several years. The real test comes only in periods of adversity. Many an erstwhile captain of industry is the product of favorable economic circumstances and loses his commission in the first serious business depression, or other change in the character of the problems which his company must face. It may be of interest to comment briefly on transitory causes of business profit.

Whatever one's convictions on the merit of a high protective tariff may be, there can be little doubt that it often fosters a spirit of managerial complacency, or self-satisfaction, and fails to stimulate initiative and creative thought. In this country we have several woolen and worsted mills which can and do make products the equal of those from foreign looms. We have dozens of other mills which manufacture inferior cloth at high cost with obsolete machinery. Many of the latter have survived and made profits in several years, solely because of the shelter afforded by the tariff wall. In many other industries, we protect the inefficient and incompetent and enable them to make profits behind legal barriers. In protected industries, the investment banker must always contemplate the effect of tariff changes.

A shift in the economic location of an industry may materially affect the profit showing of companies which have previously had long records of financial success. A case in point is the cotton manufacturing industry of New England. A large part of the industry is now located in the Southern States, favored by cheap labor and power and proximity to raw materials. Many efficient mills in New England are still able to make money, but a considerable number are unable to meet effectively the Southern competition. In some instances, particularly on cheaper cloth constructions, the Southern mills possess decided economic advantages, but nearly every textile trade journal comments at length on the inefficient methods and obsolete machinery of unsuccessful mills in New

England. There is a deep seated suspicion that management has too often been content with the cloistered walls of its own factories and oblivious to the new trends of industry.

The monopoly of patents and trade processes is a prolific cause of transitory profit. There have been many companies which have failed when their basic patents have expired. They are often unable during a long period of easy going to work out satisfactory plans for protecting their business when the legal safeguards disappeared. Others have used their profits to develop new lines or to become so firmly entrenched that they could face the future with comparative equanimity. New inventions and changes in the arts frequently menace the profits of enterprise. All too often management is unprepared to meet these contingencies. A somewhat similar source of temporary profit is the favorable long term contract, lease or franchise. There is probably no better illustration of the latter than the perpetual five cent fare franchise for urban electric transportation. In earlier years, it was a source of lucrative profits, but rising costs and automotive competition have taught us the folly of hitching the economic future to a fixed unit of coinage.

Changing price levels not only affect profits in public service industries, but they present one of the most baffling of problems in the analysis of industrial profits. In industrial accounting, it is customary to determine gross profit by deducting from net sales the cost of goods sold, which is computed by adding to the inventory at the beginning of the year, the cost of goods purchased during the year and certain other items and subtracting from this sum the value of inventory on hand at the end of the year. The inventory is priced at cost, or at cost or market, whichever is lower. A company may have a relatively constant output and yet changing price levels will produce wide variations in gross and net profits. If we add to the price variable a production variable, the complexity of the problem is increased. Skillful management may, of course, be able to reap part of the benefits of price advances or avoid part of the danger in declining prices. It may be able to forecast broad basic changes in general business with a considerable degree of accuracy, but there is always a twilight zone of profit in which it is difficult, if not impossible, to determine whether good luck or good judgment has been responsible for the results. Probably there is a tendency to judge management only by financial results without any thoughtful consideration of the part played by economic changes. This tendency is particularly evident in a period of general prosperity; it takes a depression to prove its fallacy.

The successful management is prone to expand too fast. It is apt to put great emphasis upon recent profit showings without due appreciation of the transitory nature of much of that profit. Men must dare to achieve; the will to venture must not be stifled. All progress is the result of intelligent risk assumption. In the enthusiasm engendered by brilliant achievement, management may sometimes forget the lessons of the more remote past. It is the function of the investment banker to provide the funds for future growth but always with proper appreciation of the risk. He must steer to middle ground. He must provide the capital under conditions fair alike to the company and to the investor. To accomplish this purpose, he has found it necessary in bond and preferred stock financing to set up certain restrictions with a view toward curbing too rapid expansion and toward protecting the capital commitments of his clients. These restrictive covenants are deserving of brief attention.

In recent years there has been notable progress in developing a technique for industrial bond and preferred stock financing. The typical industrial company habitually shows a much greater instability of earning power than either railroads or public utilities. For this reason, attempts to control debt expansion by the establishment of fixed ratios between present and proposed interest charges and the amount of earnings available therefor are probably of doubtful merit, although they have been tried with some degree of success in a few instances. Likewise, there is no assurance that a large investment in additional plants will be productive. We cannot guess the added productivity as precisely as in the case of public utilities or possibly railroads. It is therefore necessary to set up controlling ratios in our mortgages, indentures and trust agreements which are designed to prevent too liberal dividend distributions, to conserve a reasonable relationship between current assets and current liabilities, and between net current assets and funded debt. We do, of course, limit indebtedness in relation to fixed assets, but these clauses are commonly used in connection with the former restrictions. Our theory is that most financial trouble originates through failure to safeguard current asset position and that large net current assets are the best protection of the bondholder in the event of receivership.

We have found that large industrial plants can seldom be sold in foreclosure proceedings at more than a mere fraction of their cost. The bondholders often realize much more through the participation of their deficiency judgment with the general creditors in the distribution of the net current assets. We therefore aim to establish ratios which will prevent the dissipation of current assets.

There are various types of ratios of which the most common are: (1) ratio of current assets to current liabilities, (2) ratio of current assets to current liabilities plus funded debt, (3) ratio of net current assets to funded debt. The mortgage or trust agreement defines the precise meaning of these terms. The stipulated minimum ratios for current assets to current liabilities vary widely according to the type of business and the skill of the bargaining parties, with the chief emphasis placed on the conventional two to one ratio. Net current asset ratios range from fifty per cent of funded debt and upwards. The investment contract usually provides that no dividend can be paid which impairs these agreed ratios. Failure to maintain these relationships may, under certain conditions, constitute an event of default and precipitate receivership. This example has the typical restrictions and also a net tangible asset clause.

> The Company will not issue first mortgage bonds on account of future capital expenditures, nor declare or pay on its outstanding capital stock any cash dividends applicable to any period subsequent to July 1, 1922, except out of income after such date available therefor, unless upon the completion of such additional issue of bonds, or such dividend payment in either case:
>
> (1) Its current assets shall equal at least two hundred per cent of all its current liabilities, and
>
> (2) The excess of its current assets over all of its current liabilities shall be equal to at least fifty per cent of the aggregate amount of bonds then outstanding, and
>
> (3) Its net tangible assets as defined shall equal at least 275 per cent of the aggregate amount of bonds then outstanding, and it will not declare or pay any cash dividends on its outstanding capital stock in excess of the rate of six per cent per annum unless net tangible assets as defined shall equal at least 325 per cent of the aggregate amount of bonds then outstanding.

Restrictive covenants of a somewhat similar nature have been used in preferred stock financing. Here, again, the purpose is to prevent unsound expansion and provide real protection for the preferred stockholder. If we could be sure that management would always be scientific in the broadest sense of the term, these and many other similar covenants would not be needed. The financing of our best companies is not ordinarily accompanied by severe restrictions upon expansion.

In the course of this discussion we have indicated several reasons why the investment banker is interested in scientific management, but there is another reason of broadest social significance. For want of a better term, we may call it the "new trusteeship of management." It refers to the great popularity of common stocks among small investors and the pressing need for appropriate recognition of this social responsibility. We are not unaware of the ceaseless effort of men of high ideals to perfect managerial methods in the interest of employe, customer and stockholder, but there have been sufficient instances of failure to sense this newer responsibility to warrant some emphasis on the changed character of the stockholdings. It is not necessary to present the detailed statistics of small stock holdings as determined by the Federal Trade Commission in its study of national wealth. For our purpose, it will suffice to say that in 1924, approximately twenty per cent of all dividends reported on personal income tax returns were included in returns with net incomes under $5,000. Since that year there has been an unprecedented advance in stock prices which has been considerably stimulated by the new philosophy of common stock investment. Countless thousands of small investors who held Liberty Bonds have found the return unsatisfactory and shifted into common stocks where there was higher yield and prospect of greater appreciation in market value. With the advance in prices of good bonds, the temptation to go into stocks has become even greater. Much of this money has gone into worthless securities, but there has been a tremendous increase in the number of small stockholders in our well known corporations. Upon management falls the mantle of this new trusteeship. It is a grave responsibility. It calls for the widest application of scientific principles and higher development of the art of administration.

What is this ideal management which means so much to the small as well as the large stockholder? It is not a sales type of management. It is not a production type of management. It is not a "hunch" type of management. It is the management which spares no reasonable expense to develop and apply scientific methods. It is the management with economic perspective, imagination, initiative, open-mindedness, integrity and high ideals. It is the balanced management, which does not worship system as an end in itself, but evaluates planned effort in terms of rationally expected achievement. In the words of the master exponent of its philosophy:[3]

"It is no single element, but rather this whole combination, that constitutes scientific management, which may be summarized as:

"Science, not rule of thumb.

"Harmony, not discord.

"Co-operation, not individualism.

"Maximum output, in place of restricted output.

"The development of each man to his greatest efficiency and prosperity."

In the hands of such management, capital is always best protected.

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[3] F. W. Taylor, "Principles of Scientific Management," (1913 Edition), p. 140.

The Spring Meeting — May 7-8
Detroit-Leland Hotel, Detroit, Mich.

In co-operation with the Society of Industrial Engineers and the Society of Time Study Engineers

Monday, May 7

Forenoon

Presiding: Morris Llewellyn Cooke, President of the Taylor Society.

"Major Characteristics of the Taylor Technique of Time Study" by Dwight V. Merrick, Consulting Engineer, New York.

Discussion will consider especially the uses of time study and variations in use according to conditions of operation. It will be led by William O. Lichtner, The Thompson & Lichtner Co., Incorporated, Boston, and L. K. Fyler, Eaton, Crane & Pike Company, Pittsfield, Mass.

Afternoon

Presiding: Gordon Lefebvre, Oakland Motor Car Company, Pontiac, Mich.

"Study of Fundamental Operations of a Machine vs. Study of Individual Operations" by G. E. Schulz, Armstrong Cork Company, Linoleum Division, Lancaster, Pa.

"Unit Times vs. Overall Times" by Earl Watson, Pontiac Motor Car Company, Pontiac, Mich.

"Classification, Filing and Indexing of Data" by S. M. Lowry, The Procter & Gamble Co., Ivorydale, O.

Discussion will be led by Eugene Bouton, Chandler-Cleveland Motor Corporation, Cleveland, O., and Allan H. Mogensen, University of Rochester, Rochester, N. Y.

Evening

Presiding: Louis Ruthenberg, General Motors Truck Corporation, Detroit, Mich.

"The Relations of Time Study and Motion Study" by Lillian M. Gilbreth, Gilbreth, Inc., Montclair, N. J.

"Standardization of Conditions and Analysis of Operations" by G. J. Stegemerten, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Discussion will be led by E. K. Wennerlund, General Motors Corporation, Detroit, Mich., and Howard G. Benedict, Consulting Engineer, South Orange, New Jersey.

Tuesday, May 8

Forenoon

Presiding: W. W. Nichols, D. P. Brown Company, Detroit, Mich.

"Selection of Workers for Observation" by Joseph A. Piacitelli, The Barber Asphalt Company, Maurer, N. J.

"Number of Workers to be Observed" by M. E. Stearns, Wilson Western Sporting Goods Company, Chicago, Ill.

"Methods of Observation" by A. L. Kress, United States Rubber Company, New Haven, Conn.

Discussion will be led by Hugo Diemer, La Salle Extension University, Chicago, Ill., and C. Plummer, Dodge Brothers, Inc., Detroit, Mich.

Afternoon

Presiding: Charles Mottashed, Hudson Motor Car Company, Detroit, Mich.

"Analysis of Data and Computation of Net Times" by George DeGraw, Dodge Brothers, Inc., Detroit, Mich.

"Computation of Allowances" by Stephen B. Sponder, Chicago Flexible Shaft Company, Chicago, Ill.

"The Production Study as a Check" by L. W. Haskell, Dodge Brothers, Inc., Detroit, Mich.

Discussion will be led by H. W. Barry, Packard Motor Car Company, Detroit, Mich., and Harry Ford, Cadillac Motor Car Company, Detroit, Mich.

Evening

Joint Meeting with N.R.D.G.A.—Hotel Statler.

Presiding: J. H. Paswaters, Chairman, Store Managers' Division, National Retail Dry Goods Association.

"The Application of Time Study to Shop Operations" by L. W. Haskell, Dodge Brothers, Inc. Detroit, Mich.

"The Application of Time Study to Office Workers—Both Clerical and Machine" by W. H. Leffingwell, The Leffingwell-Ream Co., New York.

On Wednesday, May 9, plant visits have been arranged with Cadillac Motor Car Company, Dodge Brothers, Inc., Ford Motor Company, Hudson Motor Car Company, and Packard Motor Car Company.

Smoothing the Wrinkles from Management[1]
Time Study the Tool

By SANFORD E. THOMPSON
President, The Thompson & Lichtner Co., Boston

THE MODERN executive is appreciating the fact that time standards are of major import in management, that the manner in which these are handled frequently means a difference between profit and loss in his balance sheet and a choice between contented workmen and labor unrest.

The use of time study is spreading rapidly—more rapidly perhaps than a thorough understanding of its principles. Lack of appreciation of its importance on the part of chief executives may lead, on the one hand, to the hiring of inexperienced young men to handle a job that requires experience and judgment and, on the other hand, to the engaging of service vendors to introduce a "system" dealing simply with the placing of a piece price upon a job without regard to its manner of performance or to its setting in the business as a whole.

The improvement of any business, whatever its nature, requires a broad treatment dealing with finance, marketing, budgeting, master planning, inventories, production control, standardization, wage determinations and cost control. The development of time standards is only one element in the broad improvement program, an element of vital importance but one that should not be treated independently nor to the exclusion of the other elements. It should rather be part of a broad conception which includes, allows for and develops all aspects of the program.

Results of Time Standards

Time standards, properly developed through time or motion study, (1) reduce labor cost through a higher and more uniform rate of production; (2) reduce idle time of men and machines through the accurate planning which they make possible; (3) maintain, insure or improve quality by aiding in the adoption of uniform and best methods; (4) aid sales by providing accurate knowledge of labor costs, and (5) improve labor conditions and decrease labor turnover by giving a square deal and increased earnings to the worker.

Purpose of This Paper

This paper is designed, first, to present fundamental principles and practical methods of using time studies in the various functions of a business and, second, to show specifically the place in industry of time measurement and job analysis as a tool of management.

It is not assumed for a moment that time study is a cure-all for irregularities in management—that its use can smooth out all the "wrinkles." In a machine shop, for example, the establishment of standards of feed and speed may precede time study to good advantage. In a pulp and paper mill, the process standards are more important than time standards and result in reduction of labor and easier performance. Time study further assists, however, in obtaining and maintaining process standards. Furthermore, it is apparent that the basic principle of time analysis, that is, the consideration of the elements of any problem, whether it be in process, machinery or men, forms the basis of our wonderful present-day developments along research lines.

Time study is often looked upon simply as a mechanism for setting piece rates, and determination of standard times for fixing incentives is of great value. Time study has, however, a still broader use which is insufficiently recognized. It is a tool for the development and operation of controls that enables management to know what a standard day's work is and to obtain this standard from each machine and work place. Thus a maximum production is secured from a minimum of equipment and personnel. The by-product of this is a highly productive and *highly paid* personnel. Treatment of the subject, therefore, must include these factors, so important from the point of view of both material and human economy, and also the usefulness of time standards in fixing the selling price of manufactured articles.

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[1] Paper presented before a meeting of the Taylor Society, New York, December 9, 1927.

Uses of Time Study in Business Management

The field of time and motion study with its effect upon a business as a whole is scarcely appreciated, even in the more modern plants. Illustrations in later paragraphs are of particular interest in showing what an important tool time study can be made in practical plant operation, from the standpoint both of economy and of labor relations.

The two most important uses of accurate time standards are: (1) fixing measures for determining incentives that accurately balance different operations, insure the best methods of operation, provide for ease of production and promote uniformity of quality of product; and (2) production control, where the time standards are utilized in co-ordinating the number of operatives with production or in co-ordinating production with the number of operatives.

The results are a minimum of idle time for operatives and machines, the shortest time in process, delivery of goods on schedule, reduced costs and increased earnings of operatives.

In addition, accurate time standards are essential in the establishment of correct cost standards in the manufacture of complicated products or a variety of styles.

To accomplish satisfactory results along these various lines time study must be based on certain essential principles. The so-called time study which is frequently employed does not follow these requirements and is therefore totally inadequate to accomplish these results.

Essential Principles of Time Study[2]

There are certain fundamental principles of time study analysis which are of universal application. The disregard of any one of the following principles will almost inevitably destroy the value of the time study.

1. The prime purpose of time study is to enlarge production effectiveness through improved methods and thereby to increase returns to the individual worker.
2. Time study must be practised as a settled policy through a man or department, not controlled by departmental foremen.
3. Time studies must always be made with the knowledge and co-operation of the operative observed. If practised secretly, they are subversive of morale and futile in results.
4. Tools and machines must be standardized in advance of or in conjunction with time analysis, if such standardization has not already been accomplished.
5. Methods of performing each operation and the quality of workmanship must be studied and recorded, as well as the times. Time studies which disregard methods are of little value.
6. The stop watch must be run continuously and, in addition to the effective times, all delays should be recorded and described.
7. Studies must be made of the time elements of each operation, divided into small enough units to be utilized in various combinations.
8. Enough operatives must be observed to obtain fair average time standards, and before utilizing the data continuous check production studies, lasting several hours where possible, should be made.
9. A more expert handling, a more careful training and a greater intelligence are required for the analysis of studies and the establishment of standards than for taking the studies themselves.
10. It is important that records should be intelligible to persons other than the original recorder and that they should be available for the inspection of those interested.

These essential principles in general are self-explanatory and their importance is evident. The points enumerated are taken up in subsequent parts of this paper.

Principles of Unit Times

As long ago as 1885, Frederick W. Taylor developed the principle of unit times; that is, the breaking up of an operation into motions or elements which can be used for recombination into various other operations in the same way that the twenty-six letters of the alphabet in different combinations can be made to spell many thousands of words. Notwithstanding the time that has elapsed

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[2] For complete and comprehensive information on time study principles, methods and results, see William O. Lichtner, "Time Study and Job Analysis," The Ronald Press, New York, 1921, and Dwight V. Merrick, "Time Studies as a Basis for Rate Setting," Engineering Magazine Co., New York, 1919.

—over forty years since this discovery by Taylor —it is astounding how few time studies are made in such a way that they can be utilized properly. In other words, the vast majority of so-called time studies, even at the present time, simply record the total time of the single operation observed, with no thought of the best method, with no analysis of delays and with no recording of the elements of which the operation is composed. With this in mind it will be of interest, after briefly discussing the present state of the art, to give one or two elementary illustrations of the practical application of unit times.

The principal illustration will be from the shoe industry. While this industry is one of the oldest in the use of incentives, and piece work is nearly universal, we venture to say that of all the shoe factories in this country, the concerns that set piece rates by any other means than guess and comparison—those who really consider the correct time for each element of an operation—number a very small fraction of one per cent. And yet it is the utilization of these unit time elements that makes it possible not only to eliminate the irregularities in piece rates, to give the workers a fair deal, and to fix incentives on new styles, but it also, as we will show, provides a correct basis for determining the number of personnel for any required production and the most economical layout of work.

The Crime of Improper Time Study

The vast majority of piece rates or other incentives, even at the present day, are set by guess or estimate. A common plan is simply to time the operations as they are going on, without regard to the method. The opportunity to effect large cost reductions through improvement in method is thus neglected and the way prepared for irregular, abnormal earnings. Another plan is to take simply over-all times without analysis into units, so that new times have to be taken for every new job. Still another plan, very common, is to time the operation very carefully into units or elements and then not use these elements at all.

In shop after shop also, even now, the rates are set by the judgment of the foreman, based on approximate records or on tests under abnormal conditions, checked possibly by inaccurate times which the foreman takes from a stop watch carried in his pocket.

Here is an illustration of a really common method of rate setting. I was in Holyoke not long ago, talking with a young man in a paper products factory. I asked him how the piece rates were set. He looked at me rather humorously—he had taken an industrial course at college—and said, "Well, the foreman looks over the past records and sees what has been done on similar jobs and then he figures it up and thinks it over. He considers what he thinks he could do if he were performing the operation and then sets a rate. If the men kick like hell, then we know that the rate is right."

To show what a textile mill foreman honestly thinks is the proper way to set piece rates, I quote from an article in *Textile World* of September, 1927, entitled, "Uniform Piece Work Rates. Studies by Foreman Result in Fair Rates."[3]

> It is not difficult to establish uniform piece work rates. The foreman can time operations at the various machines. This is usually done by forcing production at certain machines and when production is at its height, securing the time of the operator without his knowing it.
>
> It is very important that the employes be unaware of the timing, or they are apt to slow down production, thus defeating the purpose of the timing. By using the timing process, uniform rates can be established, and every piece worker then has an equal opportunity of making a living wage depending upon his individual skill.

No wonder, with such practices as this—and unfortunately this represents actual practice in many plants—time study is often misunderstood and condemned.

But even where the foreman does have a clear idea of what he is driving at, he simply cannot be expected to handle a specialized thing like time study or the fixing of incentives with satisfaction. Inaccuracies such as are always incident to this kind of rate setting were revealed in a garment shop recently. The factory in question manufactures coats and the operation of "making" was on piece work. The plant was fairly well managed. In examining the operations before making time studies to set accurate incentives and also to use in planning the work, discrepancies such as these were found. On five principal operations the operatives worked from seventy-seven per cent to ninety-two per cent of the hours they were in the plant and loitered the rest of the time. Any planning data based on earnings and hours would have been inaccurate in total from eight per cent to twenty-three per cent and, when the irregularities of the individual piece rates were also considered, there were discrepancies of as much as fifty per cent.

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[3] By Harry E. Kaemmer.

In a plant in another industry, the piece rate on a new style was carefully estimated by an intelligent foreman. In spite of this the operative earned a little more than double the hourly rate the foreman figured he should earn. In other words, the foreman's careful estimate of the time standard was over one hundred per cent high. Estimates such as these are just as likely to be wrong in the other direction.

There is another type of so-called time standardization that frequently is carried on as a fixed policy. The purpose is to set rates quickly. It results, however, not only in inaccurate times, but in the necessity of timing the operations on every new style or part, instead of utilizing the unit times obtained by thorough analytical study to quickly set the new time. These "get rich quick" methods take no note of the method of performing the operation and make arbitrary allowance for the speed of the operator, relying entirely on judgment to fix the allowance and set up new independent times for each job.

This scheme had been in operation in a plant making machinery of complicated and diverse design requiring an immense diversity of small parts, many of them made up very infrequently. When an order for a new part came along, instead of utilizing data on file, the time study man would go out to the operative and take an observation on the first part of a lot, which might occupy the worker from less than one to three days. From these few studies on this one man he would set a rate, guessing at the proper allowance for rest and the variation in speed of the worker from the average. The results were, as would be expected, a heterogeneous set of times and rates, with no uniformity. For example, in checking the so-called standards, it was found that two machine parts, precisely alike but carrying different numbers because belonging on different parts of a machine, were given at different times separate piece prices differing by twenty-five per cent. In other words, two identical operations were "standardized" at different times, with a twenty-five per cent variation in the rate.

True, this method of setting standards begins to show results immediately, but it never comes to an end. On the other hand, the methods which give accurate results are simple and scientific, require much less time and labor, taking all in all, and, as time goes on, reduce the time study work to a minimum.

A discussion of improper methods is scarcely complete without reference to certain practices of employers, which fortunately are growing infrequent, those of using time study for undue speeding up. As a matter of fact, in practice such purposes soon defeat themselves. On the other hand, the stop-watch is an effective tool for labor co-operation, because through it facts may be established that cannot be gainsaid. In practice, contrary to common belief, it is the workman who appreciates, even more quickly than the employer, the value to him of real time study and it is he who can gauge the correctness of its operation.

Fixing Time Standards in a Shoe Shop

Because of the vital importance of understanding the fundamental principles of unit times, let us take up a special case in rather elementary fashion.

The operation is one in shoe making called "hand folding." In various parts of a shoe, the raw edge of the leather, after skiving to a tapering edge (another operation), is cemented, turned back over itself by hand, and sealed with blows of a hammer to show a neatly rounded edge. At sharp curves or angles the edge has to be clipped or "snipped" to take the curve. In Figure 1 are shown pieces of leather on four different styles of shoes. One is a top, another is a tongue, a third a tongue of a different style of shoe and the fourth is another top, very different in style.

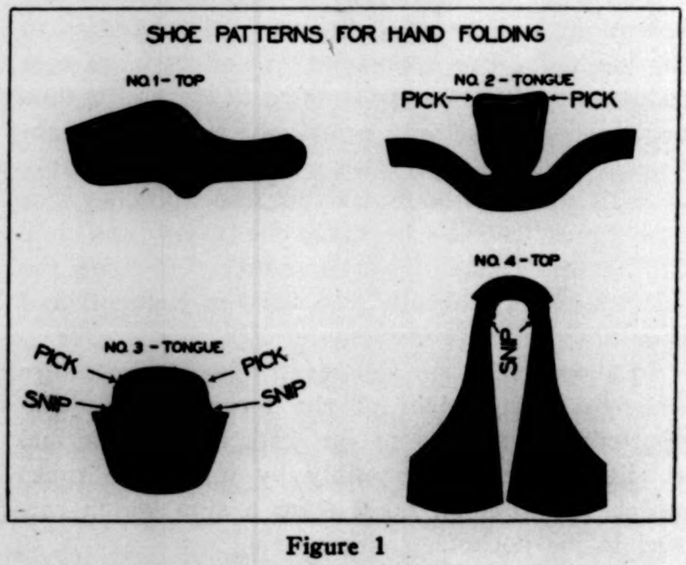

Figure 1

In making each of these varied pieces, and in fact for all hand folding, there are just five elements or units which make up the operation.

These are: (1) cement, for which the time is taken from a standard curve made up from time study to give the variations in time according to the length of fold; (2) snip, a constant time for each concave curve; (3) fold, a constant time per inch of edge to be folded; (4) pick, a constant time to pick in and smooth a convex curve of ninety per cent or less; (5) handle, which covers the laying aside of a complete piece and placing the next piece ready to be folded.

The following table gives the unit times on each of the four pieces shown in Figure 2.

STANDARD TIMES ON HAND FOLDING[4]

No. 1 Top Minutes	No. 2 Tongue Minutes	No. 3 Tongue Minutes	No. 4 Top Minutes
0.068 Cement 8"	0.062 Cement 6"	0.059 Cement 5"	0.077 Cement 12"
0.093 Handle	0.093 Handle	0.093 Handle	0.093 Handle
0.220 Fold 8"	0.165 Fold 6"	0.114 Two Snips	0.114 Two Snips
		0.138 Fold 5"	0.330 Fold 12"
	0.156 Two Picks	0.156 Two Picks	
0.381 Total	0.476 Total	0.560 Total	0.614 Total

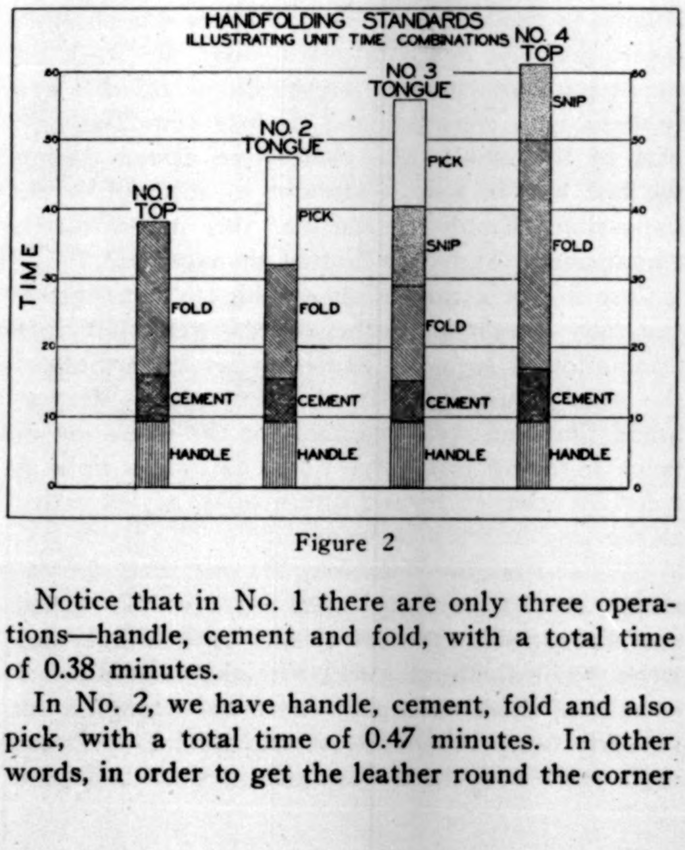

Figure 2

Notice that in No. 1 there are only three operations—handle, cement and fold, with a total time of 0.38 minutes.

In No. 2, we have handle, cement, fold and also pick, with a total time of 0.47 minutes. In other words, in order to get the leather round the corner in this case, the tool had to be used to make the necessary puckers.

In No. 3, there are two picks, two snips, and in addition the edge of the leather at the convex curve is nicked every one-eighth inch, so that the edge can be folded back on itself. The total time here is 0.56 minutes.

In the fourth case, without picking, since there is no interior corner, the total time is 0.61 minutes because of the extra length to cement and to fold.

Now, as has been said, each of these total times, and in fact the times of some three hundred different styles of pieces in this one shoe shop, are made up from a combination of these five elements. When a new style of shoe comes in, it is simply necessary to select from the basic curves and tables the unit times for the new shape and add the figures together. It is evident that it is absolutely impossible to estimate the times for a new style from simple inspection of the piece, and yet this is the way that rates are fixed in most shoe shops as well as in many other industries. Either the foreman fixes the rate haphazardly, without regard to the time element, or else the foreman and a representative of the workmen get together and haggle over the matter.

The unit time method we have described, on the other hand, represents clearly the value of accurate time study in providing for variations in character of work and for setting incentives.

Time Standards in Production Control

The use of time and motion study as a broad gauge tool of management, as well as for the purpose of rate fixing, is only beginning to be recognized.[5] Mention has been made of this broader use as it relates to managerial control, although the treatment thus far has chiefly considered the operation of time and motion study in the determination of the standards themselves. The setting of incentives is only one of the uses for exact time standards; of equal importance are other uses in planning production so that manufacturing schedules will really fit the factory force and equipment, in determining the proper number of employes for given schedules, in evaluating quality, in developing best methods of operating and in determining labor costs to use in fixing sales prices. It is in its relation to these features as well as in its use for fixing accurate incentives that the value of time study is evident in smoothing the wrinkles from management.

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[4] These samples are four actual cases out of some three hundred different folding jobs in a particular shoe shop. To avoid unjustified comparison, however, the unit times have been altered and cannot be checked against actual or standard times in any factory.

The lack of appreciation, even in otherwise well regulated shops, of the time element in planning and scheduling is astounding. In our contact with various plants throughout the country, we find that most of them have certain elements of what is essentially "scientific management," although many would scorn to designate it by that term. We find, for example, that many of the up-to-date shops, and especially the larger ones, have the materials well under control with running inventories substantially identical with the "balance of stores" originated by Taylor; we find the fundamental principles of planning the work; we find manufacturing orders made out in fair shape and a certain amount of planned control in most of these plants. Yet in case after case there is the serious lack of this "time" element in planning. In other words, in making out a manufacturing schedule there is practically no study made to see whether the time capacity of all important machines and men is equal to the task required.

This disregard of the time element produces a lack of co-ordination, which in turn causes many of the troubles which result in congestion in certain departments or work places with famine in others, in the excess or deficiency of employes on different operations, in unnecessary time in process and in a consequent failure to make deliveries on schedule time. Idle time of machines or of operatives either from waiting or from slowing up the work is inevitable. This means also an increase in unit costs of production.

To overcome this delay and lost time, which is particularly noticeable in plants making complicated lines of products, the time element must be an important feature in the planning of the work. Actual examples best illustrate its importance.

Case 1. Let us take the forge shop of a plant manufacturing large complicated machinery of many styles and types. Its specifications were well laid out; its materials were under good control, but the varieties of the different parts raised havoc in meeting schedules. In working on a certain schedule, for example, designed for completion in a single month, it was found that, while it was all right on the average, there was sufficient work laid out for one particular type of equipment to keep it busy forty working days out of the possible twenty-five. In other words, the carrying out of the schedule was a physical impossibility. This situation was entirely cured by utilizing the actual times of performing the operations in making up the manufacturing schedule.

Case 2. In another shop, the machines scheduled to be made during the first half of the month left the "eye benders" with very little work, then required twice the capacity of this equipment for the balance of the month. There was only one possible result, namely, delay in getting out the work on time, plus the natural resentment of the eye benders who were obliged to lose time the first part of the month and then were driven during the last half in a vain attempt to accomplish the impossible. Employes consider this pretty rotten management, and it *is* "rotten management."

Case 3. In a certain shoe shop (in fact, this is generally customary) the orders were put into production as so many pairs per day, regardless of the time required on the different styles. It was found that one style required for the operation of fancy stitching thirty-five times as long a time as a certain other style, and intermediate styles varied all the way between these extremes. The result was a feast and famine situation. At one time, for example, there were forty fancy stitchers. They had only enough work to keep twenty of them busy one week, while the next week, with the same number of pairs of shoes scheduled, there was enough work for sixty fancy stitchers. No wonder the operators think the management does not know its business!

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[5] For a practical treatment of production control see William O. Lichtner, "Planned Control," The Ronald Press, New York, 1921.

Co-ordinating Operatives and Production

The means of correcting such situations as this, which are all too common, is through the use of time standards in planning schedules.

In the tables which follow are illustrated the manner in practical operation of adjusting, on the one hand, the schedules to the number of operatives available and, on the other hand, of determining in advance the number of operatives required.

The two schedules which follow show the number of operatives required for each operation in a garment factory for different combinations of orders.

PLANNING SHEET FOR ESTABLISHING PROPER NUMBER OF EMPLOYES BY CLASSES FOR WEEKLY PRODUCTION SCHEDULES (SCHEDULE No. 1)

Operators per 100 = Number of operators required to turn out 100 garments in a 44 hour week
Quantity scheduled = Number of garments (in hundreds) scheduled for the week
Total operators = Quantity scheduled multiplied by "Operators per 100"

		OPERATIONS											
		Seaming		Facing		Sleeve making		Finishing		Button-holing		Towels & Aprons	
STYLE OF GARMENT	QUANTITY SCHEDULED (in hundreds)	Oper. per 100 coats	Total oper.	Oper. per 100 coats	Total oper.	Oper. per 100 coats	Total oper.	Oper. per 100 coats	Total oper.	Oper. per 100 coats	Total oper.	Oper. per 100 coats	Total oper.
Coats													
No. 1 Coat........	4.32	0.101	0.44	0.292	1.26	0.264	1.14	0.225	0.97	0.056	0.24		
No. 3 Coat........		0.109		0.196		0.264		0.226		0.051			
No. 4 Coat........		0.111		0.193		0.264		0.226		0.051			
No. 6 Coat........	8.64	0.123	1.06	0.236	2.04	0.264	2.20	0.226	1.95	0.063	0.55		
No. 8 Coat........	4.32	0.113	0.49	0.244	1.05	0.264	1.14	0.226	0.98	0.037	0.16		
No. 9 Coat........	43.20	0.119	5.14	0.237	9.82	0.264	11.40	0.226	9.75	0.051	2.21		
No. 11 Coat........	43.20	0.111	4.80	0.193	8.35	0.264	11.40	0.226	9.75	0.051	2.21		
No. 12 Coat........		0.150		0.376									
Aprons													
No. 1 Apron.......	10.80											0.059	0.63
No. 3 Apron.......												0.057	
No. 5 Apron.......												0.079	
No. 6 Apron.......	24.00											0.072	1.73
No. 6L Apron......	14.40											0.072	1.04
No. 11 Apron.......	24.00											0.078	1.87
Bungalow Apron....	6.00											0.458	2.75
Towels............	120.00											0.010	1.20
Total Operators Required			11.93		22.52		27.36		23.40		5.37		9.22

The first column gives the different styles of coats and aprons and the second column the quantity scheduled in hundreds.

The third column gives the number of operatives required per day for the operation of seaming one hundred coats. For example, for one hundred No. 1 coats one-tenth of an operative is needed, while the total number of operatives for the scheduled quantity of eighteen hundred is 1.82, or two operatives. The other columns are carried out similarly for the other operations.

By adding the items the total number of operators required to carry out the schedule is found.

These tables are expressed graphically in the accompanying charts. In Schedule 1 (Figure 3), for example, from the black lines representing the number of operatives, we see that in seaming ten operators were required, while in Schedule 2 (Figure 4) five were required. Similar differences are noted in other operations. The apron and towel operators are given with the others because the same operators make aprons and towels, as well as coats.

Comparing the two schedules, it is evident that with a constant number of employes there is necessarily a great deal of lost time. In this particular shop, before adjustment, the working time averaged twenty to twenty-five per cent below normal. By

PLANNING SHEET FOR ESTABLISHING PROPER NUMBER OF EMPLOYES BY CLASSES FOR WEEKLY PRODUCTION SCHEDULES (SCHEDULE No. 2)

Operators per 100 = Number of operators required to turn out 100 garments in a 44 hour week
Quantity scheduled = Number of garments (in hundreds) scheduled for the week
Total operators = Quantity scheduled multiplied by "Operators per 100"

Style of Garment	Quantity scheduled (in hundreds)	Operations											
		Seaming		Facing		Sleeve making		Finishing		Button-holing		Towels & Aprons	
		Oper. per 100 coats	Total oper.	Oper. per 100 coats	Total oper.	Oper. per 100 coats	Total oper.	Oper. per 100 coats	Total oper.	Oper. per 100 coats	Total oper.	Oper. per 100 coats	Total oper.
Coats													
No. 1 Coat	18.00	0.101	1.82	0.292	5.25	0.264	4.75	0.226	4.05	0.056	1.01		
No. 3 Coat		0.109		0.196		0.264		0.226		0.051			
No. 4 Coat		0.111		0.196		0.264		0.226		0.051			
No. 6 Coat		0.123		0.236		0.264		0.226		0.063			
No. 8 Coat	27.00	0.113	3.05	0.244	6.59	0.264	7.13	0.226	6.10	0.037	1.00		
No. 9 Coat	27.00	0.119	3.22	0.237	6.40	0.264	7.13	0.226	6.10	0.051	1.38		
No. 11 Coat		0.111		0.193		0.264		0.226		0.051			
No. 12 Coat	30.00	0.150	4.50	0.376	11.28								
Aprons													
No. 1 Apron												0.058	
No. 3 Apron	12.00											0.057	0.68
No. 5 Apron	18.00											0.078	1.41
No. 6 Apron	20.00											0.072	1.44
No. 6L Apron												0.072	
No. 11 Apron												0.078	
Bungalow Apron	36.00											0.458	16.50
Towels	90.00											0.010	0.90
Total Operators Required			12.59		29.52		19.01		16.25		3.29		20.93

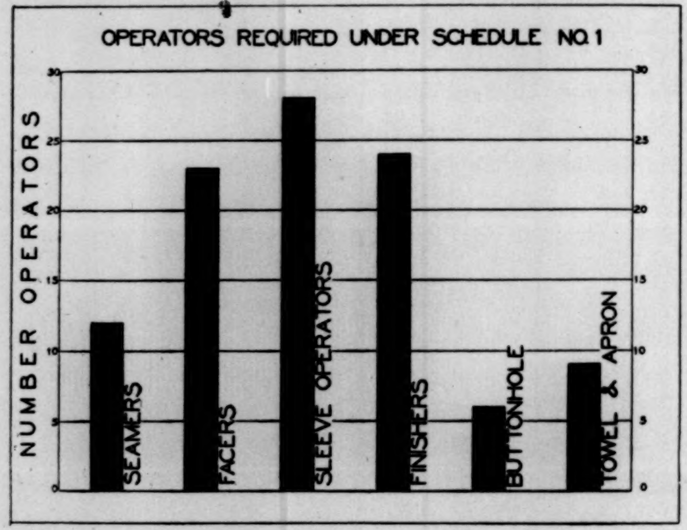

Figure 3

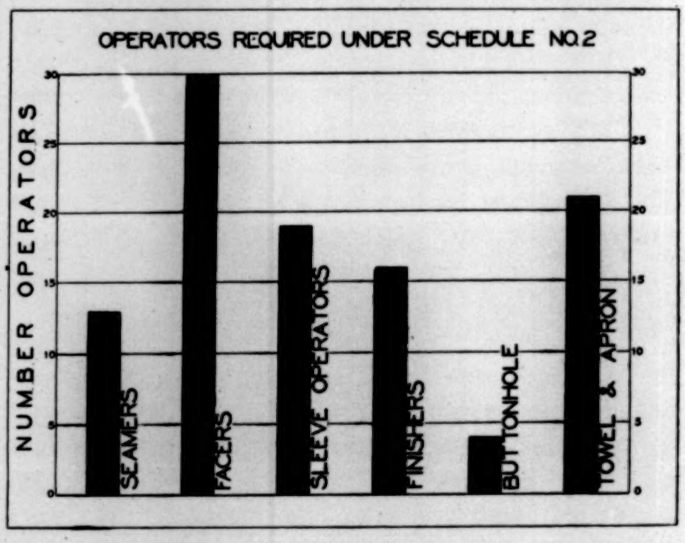

Figure 4

adjusting the schedules, however, it was found that this lost time could be practically eliminated.

In practice, then, it is possible quickly to figure in advance from the standard times how long is required for each item of a schedule, and this can be done by the unit time method whether the styles are new or old. Then either the schedule can be adjusted to fit the operatives, or, if this is impossible, as it frequently is in shoe shops because of hand-to-mouth buying, the number of operatives required for each daily or weekly schedule can be figured in advance so that the foreman will know how to provide the necessary force to turn out the scheduled work.

Cost Reduction Through Scheduling

Such scheduling as this has a remarkable effect in reducing costs in a department. If work is on a piece work basis, the employer frequently fails to recognize the fact that loss of operating time is costing him anything. As a matter of fact, since it is the weekly envelope that counts rather than the price per piece, even higher incentives are necessary with poor scheduling in order that the workers may earn fair wages. Frequently, in fact, through proper scheduling, workers may receive appreciably larger earnings even with lower piece rates. Another factor of saving is in keeping to a minimum the number of indirect day workers. It was found in practice, for example, that the introduction of scheduling of this kind in the stitching room of a shoe shop reduced costs ten per cent, while the same piece rates were maintained and the earnings of the operatives were unaffected. In one case, this reduction in cost was effected by eliminating peaks of production which formerly had been taken care of by keeping an excess of day workers.

Furthermore, by such co-ordination of schedule, waste time is naturally eliminated, a freer flow of work through the shop secured, time in process shortened, and goods are produced and delivered on schedule time.

Ineffectiveness of "Approximate Times"

Frequently the remark is made that this scheduling by times is all very well but that approximate or estimated times will serve the purpose, especially when they are figured backwards from the ordinary piece rates, and even though these have the common large inaccuracies. Experience shows that this is not the case. In order properly to balance the work it is just as necessary to work out time standards accurately as it is to secure well balanced incentives. For example, practically all piece rates based on past records or comparisons contain many items which are inaccurate by more than fifty per cent. These inaccuracies throw out the entire program of the schedule.

In many instances scheduling by exact times is as much superior to scheduling by approximate times as the latter is superior to haphazard scheduling. In other words, the results are not obtainable by half measures.

Quality

Quality is improved by time standardization and work carried on under incentives is of a higher grade than ordinary day work, provided the incentives take this factor into account by giving the workers special credit for satisfactory quality. In certain industries, such as the continuous processes of pulp and paper mills, incentives may be based entirely on quality and maintenance of standards, with no time element entering in directly.

Importance of Time Study in Fixing Sales Prices

Time study enables the accounting department to translate the normal cost per hour into a standard and accurate unit cost of product, and the sales department to sell the product on a fairly stable and unchanging manufacturing cost. The sales department also can feel fairly well assured that manufacturing costs on this accurate basis are to be adhered to by the manufacturing department. Time standards insure uniform labor costs and are the means of accurately comparing different types of product. The importance of this factor is being recognized by only a comparatively few business organizations. Even at the present time selling departments are often unable to use cost figures supplied by the costing department on account of the radical fluctuation in actual costs, due to increased or decreased actual expense and increased or decreased plant activity.

Rules for Time Study[6]

Earlier in the paper the fundamental and essential principles of time study are presented. Its practical uses as a tool of management are also outlined. It remains, however, to enumerate briefly certain important details of the process of time study, the use of the stop watch, the taking of the observations, and the development of the standard times.

1. *Organization.* Time study is a function distinct from plant operation. In a small plant one man only may report to the manager; in a large plant a "Methods Department" should be established to handle time study, rate setting and the

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[6] See William O. Lichtner, "Time Study and Job Analysis," The Ronald Press, New York, 1921. Not only is time study practice covered in full detail, but numerous illustrations are given, showing the results of "time study" and the way to train the time study operative.

development of production control and cost control methods.

2. *Personnel.* A time study man must be competent to develop time standards and to utilize these in rate setting, production control and cost computations. He must be a man of infinite patience, keen judgment, tact and experience in business. He must have a good head for figures and be able to analyze conditions and methods of operating, suggest changes in equipment, work up the data and constructively utilize it.

3. *Implements.* A watch is required—not like a foot-ball timer, which operates entirely from the stem, but constructed so that the stem pressure simply throws the hand back to zero, while a slide on the side of the case starts and stops the hand. The dial, preferably, is divided into tenths and hundredths of minutes.[7] This decimal system is convenient in working out results to avoid converting seconds to minutes.

Printed time sheets eight and one-half by eleven inches in size should be used. These sheets are mounted on a thin board having a projection at the upper right hand corner to hold the watch, which should be in plain view.

4. *Making Ready for Time Study.* The period at which time study should be made is governed by the character of the work. This may fall into several distinct categories: (1) operations such as machining, where the standardization of speeds, feeds and tools may be begun in advance of time study; (2) operations wherein quality, or non-uniformity of material from the preceding processes, or intermittent supplies, require a delay in time analysis, until the preceding operations or departments, or the control of production, are brought into line; (3) operations of hand, and sometimes of machine, work where the method of performing the operations can be studied coincidentally with the timing, and the time or motion study data used with the recorded notes in determining the best methods of operation or process; (4) operations, such as stitching or other simple repetitive work, which are of a standard elementary nature and can be time studied whenever desired.

In addition to these might be mentioned operations involving process where time is not a direct element but where standards of quality and of process must be fixed by research, with little or no utilization of time study. Still another condition occurs when in starting up a new plant it may be necessary, in order to keep down labor cost, to set temporary standards by approximate studies. In such cases, if incentives are set, the operators must be informed by written notice that they are temporary and will only continue for a definite period. All this, however, is makeshift and should be avoided. It is better to concentrate on fixing accurate incentives promptly.

5. *Selecting Workmen for Observations.* In the fixing of standards of performance, the workmen observed must be adapted to a degree representative of the average of the best group of workers available in the particular locality. These average workers must receive a fair reward, which, if gauged by measured output, must produce earnings appreciably in excess of a day wage. Exceptional workers must earn exceptional returns. Inferior workers must be trained to their jobs and if they cannot attain earnings higher than the ordinary day wage must be transferred to other jobs for which they are adapted.

Although the standards are designed for the average man, operatives for most extensive timing should be peculiarly adapted to their work. These are steadier workers (a necessity for good results), and will give the best co-operation and are apt to use the best methods of work. It is important, of course, that standards should be fixed from, or based upon, the observation of a sufficient number of operatives to obtain fair average results.

6. *Approach to the Operator.* The co-operation of the worker observed must be gained before starting time study by interesting him in the work, getting his opinion and advice on methods and making him understand that the prime object is to give him regular work and higher total earnings.

7. *Making a Time Study.* Begin a period of time study with the hand of the watch at zero, but after this allow it to run continuously without throwing back between operations, or operation elements. By this plan the delays can be recorded more accurately, smaller elements noted, and a complete chronological record of the job made.

Record stops and delays. The time of each element is recorded in a vertical column and the individual times afterwards computed in another vertical column at the right. The time of every delay and stoppage must also be recorded, with the cause.

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[7] The decimal dial was designed originally by the writer and first used in 1894.

Time the units. The elements of the operation must be small enough to utilize in computing the times for new operations containing all or some of the same units. Note, for example, hand folding in shoe making described earlier in this paper.

Be sure that the worker is not working too fast for the required quality of product. Bear in mind, however, that fast workers usually are skillful workers. Have the output produced while timing inspected by a foreman or inspector to see that it is satisfactory in quality.

The number of observations to be taken must be governed by the conditions of the work. If the operation occurs infrequently in practice, less attention is needed than for one (like the operation of hand folding previously described) whose units are to be used constantly and in a multitude of combinations. Where there is a necessary appreciable variation in the time of the same unit more observations are needed than otherwise to properly distribute the larger times. Theoretically the number of observations should be such that an equal number taken independently will not appreciably alter the average time. In general a large number of observations should be made on, say, two or three operators particularly fitted for their work, and a smaller number on others. The number of operatives to observe must be sufficient to obtain a fair average of the group. Careful studies on a few (say, eight or ten out of fifty), carefully selected as representative, are better than haphazard studies of the entire force.

Fatigue is an element which in most cases takes care of itself, provided long-time observations are made extending consecutively over several hours. In certain cases separate studies of fatigue are needed.

No so-called "job try outs" are needed with the proper time study, although for psychological purposes it is best to introduce changes slowly.

8. *Necessary Delays.* As already stated, delays, as well as effective time, must always be recorded. Sometimes, however, the delay is part of a unit, in which case the time in excess of the average must be included as delay time. For example, in stitching, a thread may break in the middle of a seam. After taking out the actual time for rethreading, the time up to the break, plus the time to complete the seam after stoppage for rethreading, will be longer than where a break has not occurred. Here, then, the extra time is considered to be the difference between the normal time and the observed time including the stoppage. This may be charged to the delay caused by the broken thread.

At times the observer notes as he makes the time study that the time required for an element is inexcusably long. It is then marked "slow" and the difference between it and the average normal time is thrown into the delay time.

Delays are of four kinds; namely, (1) necessary delays—delays in actual operation that are unavoidable; (2) unnecessary delays—such delays as loafing, stopping to talk and performing extra operations not required (sometimes with the belief of the operator that he is "padding" the time); (3) job time—the time required at the end of a job to record the job, move the work away from the operator, take the next piece of work and get ready to work on it, but not the time included in placing the material ready to operate upon; (4) personal needs. After computing the average times and utilizing the long-time observations in which the operator is apt to stick to his work sixty seconds to the minute and sixty minutes to the hour, there must be a period allowed for relaxation or "personal needs." For this there is no definite time allowance, but usually it is fair to add ten per cent.

9. *Continuous Timing.* Wherever practicable, before computing the standard times, a continuous study should be made covering several hours (from three to eight), allowing the watch to run continually during the entire period and making complete records of effective times and delays. Sometimes such long-time observations can be used with advantage in making all of the time studies.

10. *Computing Standard Times.* Taking account of the corrections noted above, net unit times can be averaged directly to obtain the standard net unit time. Various other methods are used by different observers, but in practice this simpler plan of direct averages works to good advantage when used along with careful study and analysis of the conditions involved.

Summing up, the standard time of any operation is obtained by taking the sum of the net effective unit times, plus the actual time for necessary delays, plus the time required to change from one job to the next, with ten per cent added to this for personal delay and rest. Except that allowed for personal needs, no time is included that is not actually taken by the operator during observation. No indefinite percentages need be used.

Accuracy of Time Study

On work well standardized as to methods and employing skilled workers, the accuracy with which standard times can be fixed is astonishing. When rates are set by the ordinary methods of past performance and judgment, the earning power of the same operator on different kinds of work usually varies from the average by twenty-five to sixty per cent. On the other hand, when rates are set by unit time or motion studies, as outlined in this paper, this variation is actually reduced in practice to well under five per cent.

In other words, time study is really scientific and a fairly exact art. Of course, different individual workers on the same job do, and should, produce widely different outputs. Furthermore, in the case of jobs that were formerly on slovenly day work, the standards set will naturally be improved upon as the experience of the workers increases. This improvement should not be sufficient to be unreasonable, as far as technique is concerned, however. Time study men vary in their methods. Test after test, however, has shown that really skilled time study men, using different methods, will nevertheless attain similar standard times.

Measured Production an Essential to Progress

To achieve advancement it is necessary to have a gauge of comparison. The scientist must have records of what has been done in the past. The business man must know what has been and what can be done. A man is measured by his accomplishments. A factory worker must be able to show his capacity, his skill and his initiative by comparison with others and with his own past performance.

As a matter of fact, a measure of accomplishment is essential in any line or phase of business. On the other hand, the lack of satisfactory measures is responsible for a vast number of business failures and for much of the friction between labor and employers.

These are bold statements. But note the continuous unrest in the needle industries where unsystematic business methods and ill adjusted wage payments prevail. Note the attempts in the shoe industry to bargain for what should be a matter of fact record. Note the constant friction in the coal mining industry. But note especially, those of you who employ labor of any kind, the frequent undercurrent of dissatisfaction arising out of inequalities of earnings due to insufficient measurement of production or to inaccurate production control.

All of these facts emphasize the importance of the proper use of "time study" as a tool to correct and develop certain fundamental phases of business management.

Discussion

A. L. Kress.[8] It is difficult if not impossible to reconcile the point of view of the factory manager and the engineer on time study technique. The factory manager is always interested in results and he usually considers time study simply as a basis for rate setting. The engineer naturally wants to do the best job that he can. I am sure some of those to follow me will go into greater detail as to the proper time and sequence in which to take time studies. A large part of the engineer's job is in educating the management to the long run value of those time studies.

An important point that Mr. Thompson makes is that time study is a measurement of progress. Any industry which has come to realize that time study and job analysis are aids in formulating intelligent decisions as to methods has taken quite a step forward.

Concerning technique, I feel that the engineers are somewhat on the defensive, even if time study has been in use for a great many years. No two engineers use the same time study technique if they can help it. We claim, for example, that such questions as allowances are scientific, but I think we all know that they are not particularly so, and it seems to me that this question of allowances is pretty much the joker in the deck. The questions of whom to time and what to time are also matters which call for considerable thought; and here again we find widely differing practices.

Mr. Thompson fairly states that there can be no set system of time study, and yet much of the energy spent by engineers on the subject has been devoted to an attempt to perfect a formula for it. There is a question in my mind as to whether its advocates have not done it considerable harm, first in pretending it is more scientific than it really is, and second in attempting to reduce it to formulae which presumably can be used even by novices.

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[8] U. S. Rubber Company, New Haven, Conn.

No time study policy is intelligently conceived which does not have for its goal the building up and accumulating of basic elementary standard times. Mr. Thompson has emphasized that where time study is in use for rate setting only one can usually find many studies which are useless for future reference. They are not accompanied by job analysis. They represent individual studies from which individual conclusions have been drawn without reference to any previous standards of performance. Hence they are valueless.

Some fifteen years ago Hoxie made certain criticisms of time study technique which he felt invalidated its scientific standing. Those of us who believe time study is the only fair method for the determination of output will do well to heed Hoxie's criticisms. Unless we are to be on the defensive as to its scientific character, we should agree on uniformity of practice. We should continually labor to improve our technique, particularly as it involves the question of allowances. After all, it is not the stop watch which determines the standard time, but the judgment, experience and fairness of the time study man.

E. H. Eresian.[9] There is just one point I wish to discuss and that is the effect of time study on the worker. As Mr. Thompson says, ultimately it will help the worker to better himself, but I think it is essential that the thing be sold to the worker in the first place. In order to sell the thing to the worker, educational work must be done.

I think his idea of emphasizing the control feature of time study work is excellent from the educational standpoint. When time studies are used to better methods and get standards for control, the workers realize that time study is a tool for analyzing problems. I find that once the workers see that the management also is being measured, they readily appreciate the value of time study and co-operate in the making of studies for the purpose of determining standards and rates.

E. A. Teeson.[10] Mr. Thompson has given the industrial engineer's point of view and Mr. Kress has pointed out that sometimes the factory manager's is not the same. I am going to take the stand of the factory manager. In the first place, the factory manager looks at the time study primarily as a means of furnishing an incentive method of payment. It is absolutely essential, I think, that time study be the basis of such an incentive method of payment but it furnishes only the quantitative measure of performance and not the qualitative measure. By "qualitative" I mean how much the job is worth. As part of any incentive method of payment I think there should be a job rate that provides for paying the workers not only for what they turn out as measured by the time study, but also for the experience and skill that is needed to do the job.

The one best way, as Mr. Gilbreth used to put it, of doing a job should also be pointed out. I, personally, think that time study should be used first as a means of finding an incentive method of payment, and second as a follow-up on your progress in finding the best ways of doing the different jobs.

I am a great believer in putting the foreman into business for himself by giving him all his costs—of labor, materials and overhead — and making him feel that he is a part of the management rather than a production man only. You can do this by using your standard of time as a measure of efficiency. Time study also provides a way of fixing standards and gives the factory manager a chance to compare the particular performance of one department with that of other departments.

Technique is not for the factory manager to determine. There are, however, certain essentials on which he must insist. The first is that the workers be sold on time study, and that the time study man have their absolute confidence. They must not feel that time study is being used to cut piece prices or standard times, but rather to help them to do the job right and to increase their earnings. Second, it is essential that there be an accurate recording of job conditions. A great many times the conditions in a plant change without any one knowing that they are changing. No one should be allowed to make such changes without notifying the time study department in order that proper studies may be made. If this is not done standards will become lax.

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[9] Dennison Manufacturing Company, Framingham, Mass.

[10] American Optical Company, Southbridge, Mass.

Last, the divisions of time should be small enough, as Mr. Thompson has very ably brought out, so that unit times can be established and built-up standards, as well as built-up costs on new merchandise, be made from them. This is, I think, what the factory manager expects.

Stewart M. Lowry.[11] Important as time study is, it is merely a tool of industry and subordinate to industry. We cannot hope to revamp industry to fit any theory of time study. We must make time study fit industry.

For that reason it seems to me that we have got to take operators as we find them—good, bad and indifferent—and study them, getting what results we can. We must make our time study system such that we can secure accurate results regardless of the type of operator.

It seems to me that there is a fundamental weakness in averaging observations. The average of a poor operator's performance certainly will not give the same result as the average of a good operator's performance. Yet we want to establish a standard time.

Skill, effort and working conditions must be taken into consideration. They undoubtedly affect the time required by an operator to perform an operation, and I do not see how we can avoid considering them. Good skill, good effort and good working conditions will produce an entirely different result from fair skill, fair effort and improper working conditions.

The aim, after we have observations, whether we get them out of the foreman's head or whether they are made scientifically and accurately, is to arrive at a time which is correct; in other words, a standard that we can expect a man of average ability to meet, a man of little ability not to meet, and a man of exceptional ability to improve. We cannot find that average man on every operation. I know it is impossible from my experience. Therefore, if we take a study of a man who is not average we must have some way of raising or lowering, or bringing to a common level, his values so that they will be applicable to any operator who is fitted for that class of work.

Let us start with the fundamental principle that every one who is at all qualified to perform a given operation falls into a different level. Imagine a pyramid. At the peak is, let us say, the superman, a man who is one in a thousand and very seldom found in every day experience. He is a man who probably cannot keep up a sustained performance, day after day and hour after hour, of what he might do at his best. At the other extreme, or at the bottom of the pyramid, there is a level, which is a much longer line, representing the people who are just within the classification of people qualified to do the job. As we taper up, approaching perfection, our field is gradually narrowed down and the number of people limited as ability increases. In other words, the number of people available decreases in proportion as ability increases. Somewhere about midway in the height of the pyramid is a line which should represent average performance and which, in my opinion, should be used as the standard for establishing time values. If we select an operator, working on a particular operation at a machine or a bench or with any type of tool, who is above this average level of ability, we must bring his standard down to average if it is to apply to every other operator. In order to do this we must be able, as we are making the study, to classify the man. There are three important factors that must be taken into consideration in doing this—skill, effort and working conditions. It is possible to conceive of many different combinations of these three factors. A man may have excellent skill, superskill you might call it, and if he chooses, he can show very little effort. And at the same time working conditions may be good, bad or indifferent.

Let us take skill and divide it into six classifications; namely, superskill, excellent, good, average, fair and poor. Let us define these classifications and fix in our minds what qualities belong to each so that, when we observe a man from the time study observer's point of view, we can put him in a class. Do the same thing with effort; with working conditions. When we have put him in his class we have established his level in relation to the average level that we are trying to arrive at. Let us consider the average level as one. Anything above that will be plus one or more points and anything below will be minus one or more points. This gives us a factor by which we can multiply the average values arrived at from his own performance. Thus we can correct his performance to arrive at the standard that can be used for everybody.

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[11] Procter and Gamble, Cincinnati, Ohio.

That, briefly, is the principle that I advocate for adjusting time values.

Richard A. Feiss.[12] The most important things time study is expected to accomplish are accomplished without the use of time study. In other words, time study is a method for arriving at detailed information concerning results obtainable under conditions previously established and under control. The establishment and standardization of these conditions and the introduction of methods necessary for their control are accomplished without the use of time study and in themselves obtain a greater part of the results desired. It is not only necessary to standardize equipment, tools, etc., and to establish proper methods for handling and routing materials, but it is also essential to establish methods of supervision and instruction which will make it possible to maintain conditions and to train operators to follow instructions and attain the standards that may be set. These must all be provided before time study standards can be established.

A great deal has been said about the principles underlying time study methods. These discussions do not concern themselves so much with the matter of making observations as they do with the technique of using the results of observations. These differences are of no great importance. But it is essential that the standards and the methods by which they are arrived at be readily understandable by the people to whose work they are applied. It also is important to establish a technique that is applicable to every operation in a given industrial establishment. Only when this is done will time study and time study standards be acceptable to the employes of an organization.

Time study becomes acceptable only where it has been demonstrated to be an instrument for analyzing the processes of work and studying the conditions surrounding them with a view toward their standardization and for the purpose of equalizing the work and earning opportunity. This point of view is of the utmost importance. It involves both in principle and fact that the management assumes the responsibility for establishing and maintaining those conditions which are essential to an even flow of work and to the attainment of that efficiency of the individual which is required.

Above all, time study must be a definite and fair instrument for measuring attainment and establishing equitable earning opportunity. My personal experience has shown that it is acceptable to the working force on this basis. I can recollect more than one instance in which operators in the plant I formerly managed came to me to request that their operation be time studied so that it would be on the same basis as that of their fellow workers.

Of course, other things besides time study are essential to achieve such results. There must be a job classification which defines operations in terms of earning opportunity. Control of operation balances and work in process is of utmost importance both in the scheduling and control of materials and in establishing conditions prerequisite to setting time study standards. Time study may be used in this connection. The use of time studies in this and other ways tending to improve the conditions of operation should precede time studies for setting standards of performance. By doing so, the working force becomes accustomed to the use of the time study method—a thing that is advisable if not essential.

The point I wish to make is that the matter of efficiency of the individual is not a thing by itself to which a single technique such as time study can be applied in order to obtain results. Time study is the last of various techniques of analysis to be applied to any given situation. In many instances the application of other techniques is more important. In all instances they must be applied before the technique of time study can be used.

Joseph A. Piacitelli.[13] There have been several points of view expressed here today. If I take the point of view of the time study man, I can say "amen" to all that has been said, but if I take the point of view of one who is interested in reducing the enormous waste of human effort, then I cannot do so.

Mr. Thompson has touched on the subject of analyzing methods—and I believe that this point should be emphasized a little more strongly. To my mind, the method employed in performing an operation has the greatest effect on the standard that is set and on the productivity of the worker. For these reasons, the study and development of methods is the most important factor in this work. The standard should be based not only on time but on the amount of effort expended in the performance of the work, the characteristics of the work and those of the worker. To establish proper standards, methods must be analyzed from the point of view of fatigue. Unnecessary motions must be eliminated and the execution of the necessary ones facilitated, so that the energy of the worker may be expended with the maximum of effectiveness. These desirable results may be obtained by making a motion study of the job. A motion study can be made in various degrees of detail. There are cases where it is not necessary to go into a high degree of detail. In highly repetitive operations, however, it is important that the method be studied very minutely.

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[12] Richard A. Feiss, Inc., Boston, Mass.

[13] Barber Asphalt Company, Maurer, N. J.

One of the speakers stated that we must take time studies, set the rate, and after that we will get the one best way. If I have understood that correctly, I wish to say that I cannot agree. We must find the best way first and then determine the time to perform in accordance with the established method. Having established the best method which the equipment and conditions permit, and standardized it, we not only have made possible a greater output for a given amount of effort, but also a standard which will invariably result in increased earnings to the worker and reduced cost to the management.

Another point brought out is that we must time the average man, or time work on the basis of average performance. That is true if we want to know how long it takes to do a job or to get an average. But we should be most interested in bringing the performance of the mediocre workman up to that of the skilled.

The transference of skill is one of the most valuable results of standardization after the method has been studied and a careful analysis made. Skill cannot be transferred if we consider elementary operations, because we are only giving the operator a sequence of these elemental operations, as they are sometimes called, and not making a serious attempt to tell him how these suboperations are performed. For instance, let us consider the elements that are sometimes used as divisions of operations, such as "pick up piece and place in fixture." Now, it makes a great deal of difference just how that piece is grasped, with which hand it is grasped, or the manner in which it is held in order to assemble it to the fixture in the easiest way possible. All of these have a decided effect on the overall time of those elementary units which the time study observer has chosen as divisions of the method for the purpose of establishing and standardizing time values.

Skill cannot be transferred with any reasonable degree of effectiveness unless the operator can identify the method in terms of elements of motion and perform these elements of motion in their proper order. This is extremely important, especially in short repetitive operations — and has worked successfully in various kinds of activities.

Since this meeting marks an attempt to bring together and formulate the fundamentals of time study practice in order that they may be usable in industry with somewhat common results, it seems to me that any effort exerted in that direction would be worth while. My suggestion is to consider carefully the various techniques employed in analyzing and standardizing work and build up one reasonably good code which can be used in industry at large with benefit.

John C. Shover.[14] There are just three points which I wish to mention. The first is to stress the essential principles that were set forth by the speaker this morning: among others (1) that the conditions must be right; (2) that the watch must be in view; (3) that the methods must be studied.

In introducing time study in one department in which there were one hundred girls and where there had been no time study before, it was found advisable to take a great deal of time to get conditions right. The girls were not familiar with the stop watch, and so we asked the foreman to allow us to talk with the operators first. The foreman said, "No! You go in there and time those operators. It is their business to do what they are told to do. Never mind talking it over with them." Our study was delayed several days before the foreman changed his idea and gave the desired co-operation. With the foreman's assistance, the operators were told what we had in mind to do; they examined with interest the stop watch which we handed to them, and they asked questions until they understood the purpose of the study. As we went along in the study we made sure that the operators were friendly and ready for observation. If an operator appeared to be too nervous to have a time study taken, she generally replied in answer to our inquiry as to how the work was running, that it was running very badly. In such a case, we left her and returned at another time. Our study then was for the purpose of determining the best methods and of establishing a standard procedure. The study was, of course, followed by a substantial increase in production—nine to fifteen per cent per machine hour.

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[14] Production Research Department, Aberfoyle Manufacturing Company, Chester, Pa.

Another matter which I wish to bring to your attention is the importance in rate setting of making allowance for skill as reflected in the time required to learn an operation, as well as the time required to perform it. For example, let us consider one element of a certain operation, namely, locating the loose end of a ball of yarn before tying up the yarn or starting a process. Eventually the fingers detect this loose end of yarn without any loss of time, but they cannot do it in the first trial nor in the hundredth. It is well to consider the period of time required to learn to make a motion effective, for the acquired skill is worth something, and the acquiring of it costs both the operator and company. The length of the learning period of an average operator under standard training conditions may represent approximately the degree of skill involved in the operation.

Several references were made by the speaker to the relation of foremen to time study and other management studies. One particular experience will be illustrative of my third point. Individual records were carefully compiled of the production in a six months' period of over four hundred operators under various foremen, and individual production ratings were listed on the basis of average production in the six months period per man hour. At that time each operator was rated as to quantity of production by her foreman according to his observation and opinion. A comparison of the foremen's opinion ratings, with the actual production ratings showed that the foremen had placed only about fifty per cent of the operators in the classes corresponding to the statistical groups. In management studies it is quite necessary to have the foreman's co-operation and it is very useful to have the benefit of his knowledge, but it may be worth while to verify the information gained from him.

May we be permitted to offer one criticism of Mr. Thompson's paper. His time studies are so very well done that he seems to tell us that all management studies should be done with time study methods; whereas we should prefer to say that all management should be done as properly as his time studies, which are quite scientific.

George D. Babcock.[15] There is a matter of technique which I wish to touch upon. In a coincident production industry like that in Western automobile plants, we have the problem of rapidly setting temporary piece rates. When a new model car is to be produced, the mechanical or methods departments spend a great deal of time and study in determining the best types of machinery and most suitable tools for a particular operation, and in the setting of machine speeds, etc. There is little use of standard equipment. It is almost entirely specialized. Tool designing, the selection of machinery, and the plant layouts for installing that machinery always precede any direct time study. This study begins as production starts simultaneously in all departments.

Thus we must set at once a great many rates so that workers may begin to receive commensurate pay for their effort as soon as work starts. Conditions are not suitable for permanent rates and at this time studies are all temporary. Then there are the permanent rates to be set and standards to be established. We take great care in establishing these latter.

Advocates of two principal methods of time study have discussed Mr. Thompson's paper — one that carefully selects a man for a particular job and then makes an exhaustive study of all the elements involved; and another that forms an opinion of any operator's effort while he is being studied. Both methods are desirable in an industry such as ours. All our temporary studies are of the latter estimating or qualifying plan. There is no opportunity to select particular men. Quick evaluations must be made and rates set. However, when the plant is in operation and rates approximating fair earnings to the men and fair speed of performance to the superintendent have been set, we then start at the beginning again and make exhaustive detail studies, using all the standard published material in which we have confidence along with our own observations. We do this in order to arrive at constants to be used for our own purposes. A set of curves of speeds taken from the studies on the art of cutting metals has proved very practical and useful. We merely convert the hardness numbers of metals used in those studies to the hardness numbers of our own particular metals. All our preliminary time study men check their feeds and speeds in operation against these curves and are thereby able to get good temporary data very quickly.

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[15] Dodge Brothers, Inc., Detroit, Mich.

These standard data are absolutely essential to us in estimating, months in advance of bringing out a new model, just what it will sell for. On a particular new model figured this year there was one dollar difference between the estimated direct labor rate and the final set time study rate. The estimate was made before the work was in process, but only after fairly permanent designs had been submitted and a pilot model built. The same type of data is used by the mechanical or methods department in selecting machinery and designing tools. They are used to determine how much machinery and how many tools will be required to produce a given number of parts. Through contacts with the time study department, there has grown into the methods and equipment department an almost unconscious appreciation of the exact time needed to perform certain duties. The manufacturer's guarantee of how many pieces a machine will turn out is valuable information also, and used extensively by the methods and equipment department.

We have also been working for a year on a means of estimating the amount of factory supervisory labor that will be needed on a given model. This is done by getting the standard time from the time study department and applying to it a standard base rate for this class of labor. For several years, with very little change, we have used a standard base rate for various classes of labor. By this means we can get an overhead rate, and also set quotas for non-productive labor. We have found that we cannot base overhead rates on the payroll unless the payroll is based on standard time.

Once that is arrived at, we have found that, no matter how many changes there are in a department, the supervision quota will revert to a minimum line as soon as the changes are over. This has enabled us to find the cause of extensive supervision excesses above this minimum time and to evaluate them. For example, in one department it cost $25.25 non-productive excess to put one dollar of new piece price into complete operation. So throughout our whole organization we can find what the effect of our engineering changes is on our productive and non-productive department expenses.

We can get the number of productive workers for a department through our standard times and product schedule; multiply this by a standard coefficient and obtain the amount of non-productive labor; add a fixed number of persons for the salaried group and obtain a standard labor force. Excesses above this must be due to some extraordinary cause. This plan is in direct operation at the present time.

As I have stated, I think the most disturbing thing we have to confront is this need for temporary rush studies. The welfare of the worker and a great deal of money depend upon the way the work is started. Therefore, we should not be content with temporary rush studies nor try to make them the basis for standard data. The whole job should be restudied slowly and in detail, and the results of these studies used for setting standards

I am very glad that men like Mr. Thompson persistently and continuously hold to the early scientific management principles of time study. We need to remember that these scientific principles are fundamental; to realize the importance of scientific time study and standards, and to establish both.

I am looking forward to a meeting at which we can discuss time study for three days because it is so fundamental to industry today. I am frequently surprised to go into a large industrial concern and see the work of a small group of time study men unchallenged and unquestioned. The employment of labor, routing, even the installation of equipment involving huge investments, are all based on the workers' performance, and time study is its measure. The economic and human effects of the improper use of this measure are so important that every industrial executive should be interested in improving its technique. Let us generally make time study scientific as was intended at its inception.

Education for Management[1]

How Can Schools of Engineering and Schools of Business Correlate Their Curricula and Research More Effectively?

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IN ATTEMPTING to discuss the possible correlation of instruction and research in the fields of engineering and business, it will be helpful to review some very well known facts which should nevertheless be clearly in our minds as we attempt to plan educational programs for the future.

As is well known, the engineering schools are much older than the schools of business. The War of 1812 sharply directed the attention of young America toward manufacturing. Shortly thereafter an important technical school came into existence in Rensellaer Polytechnic Institute, which was established in 1824 with a one year course. With the development of American railways this institution added a three year course in civil engineering in 1835. Increasing interest in manufacturing in this country registered itself in further provision for technical education in the establishment of the Lawrence Scientific School at Harvard, and the Sheffield Scientific School in Yale, both in the year 1847. About the same time railway development in the Middle West brought the organization at the University of Michigan of a course in civil engineering. Massachusetts Institute of Technology was organized in 1865. Even the University of Illinois at the outset was called the Illinois Industrial University, thus showing the emphasis of the education of the early period of American history. Not until the year 1885 was the name of the University of Illinois changed to its present title.

The schools of commerce on the other hand have, in the main, been established since the opening of the present century. The Wharton School was established in 1881, but no other followed until 1898, when such schools were established in both the University of Chicago and the University of California. By 1900 there were seven schools of business in existence. Today there are over 180 departments, divisions, or schools which offer courses in accounting and business administration.

What is the explanation of the early emphasis on technical education and the recent growth of business education, which is one of the most significant educational developments of the present century?

During the earlier period to which reference has been made, it was logical that there should have been much emphasis upon technical education. We were at that time trying to develop manufacturing in this country and to build railroads to carry our rapidly increasing commerce. Even in our early colleges of agriculture the greatest need was that of improving the character of our grain crops and of our livestock. In the early days the corn crop consisted of too much cob and too little corn; the cattle of the period might have been thought to be the lineal descendants of the lean kine of Pharaoh. A western editor describing the swine of the early sixties in what was then the "Middle West," stated that a "typical porker" was one that could put its nose through a crack in the rail fence and rout out the second row of potatoes.

The emphasis, then, to improve production was properly placed, whether that production was concerned with machinery for factory or farm, or whether it was concerned with better grains, vegetables, or livestock.

The foundation was laid in this country for a remarkable record in the various fields of production when our Constitution prohibited any tariff between states. This establishment of free trade over such an enormous territory, rich in natural resources, was destined to produce a very large manufacturing unit, thus bringing about a geographical division of labor on a scale which had not been witnessed any place else in the world. Even persons who live in those parts of the United States where the states are large and hence are accustomed to traveling great distances, do not realize the size of the United States compared with other countries. It is not an exaggeration to say that if Texas were a lake and France an island, France could be dropped into Texas and there would be room enough to sail out of sight of land on every side. Montana is bigger than the German Empire was before the War.

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[1] Paper presented before a meeting of Teachers of Management. held in conjunction with a meeting of the Taylor Society, New York, December 7, 1927.

We have had, then, the combination of several important factors which have made the organization and rapid growth of schools of business a logical consequence. We have made a very fine record in this country in the technical processes of production and in this phase of our industrial development the technical schools played no mean part. But the large business unit brought with it many difficult problems in accounting, organization, administration, finance, personnel problems, and marketing, to mention but a few of the problems created by our success within the realms of production. But what do we gain by being highly efficient in the technical processes of production, if we are inefficient, for example, in such matters as administration, management, financing, appreciation of personnel problems, and marketing?

If the foregoing reasoning is sound, it is no mere temporary fancy that has brought into existence so many schools of business since the year 1900. These new schools must make their contribution toward the solution of many of the problems which the great success of the earlier technical and engineering schools helped to produce. And it may be added that industrial and commercial conditions have become so complex that the future engineering graduates and the graduates of the schools of business ought to know enough about the problems in each other's fields to work intelligently together.

In an attempt to answer the question which has been used as a title for this discussion, it may be helpful to raise a number of other questions.

Is it not generally agreed that engineers ought to have at least the fundamentals of economics and accounting? Surely the investigation which has been carried on by the Society for the Promotion of Engineering Education answers this question concerning economics in the affirmative. Only eighteen per cent of the engineering colleges have reported that they do not require economics. It is probably true, too, that students elect economics in many engineering colleges which do not require it.

Is it not also true that students who are pursuing courses in business would be benefited by taking a sufficient amount of work in the fundamentals of engineering to enable them to work intelligently with engineers? There has been no survey made on this point. There have been some conferences of economists and engineers on this subject, and while no definite action was taken on the matter, a committee reported, at one of these conferences, the following suggested curricula, which they believed should be given serious consideration for students of both engineering and commerce.

First: that a minimum number of hours in business training, to be determined by the committee, be required in all engineering courses;

Second: that a curriculum providing for a minimum of fifteen to thirty units in business economics be incorporated in all engineering courses and offered on an elective basis;

Third: that a curriculum in commercial or industrial engineering subjects be offered in the School of Commerce with degree to be given in that school;

Fourth: that a five year combined engineering and commercial course be prepared.

One engineer has said that not many years ago the engineer who was called upon to exercise judgment as to the feasibility of undertaking a certain project needed only engineering skill; that he could rely upon his common sense to determine whether it was practicable or advisable. This same authority is of the opinion that no such course is now open to the engineer; that the complexity of the economic and business factors are such that he can no longer discern the vital tendencies with the naked eye as it were. There would appear to be no doubt that the engineer needs both a business microscope and a busines telescope to assist him in the elimination of serious errors. This does not mean that he needs to be an expert in the field of economics and business, but it does mean that he should have some perspective of the problems which will arise, so that he will be in a position to know when to call for assistance from those who have expert knowledge of these two fields.

The same observations can be made with reference to the graduates of schools of business. Surely those who are to have important responsibilities in the business world must have sufficient foundation in some of the subjects which are basic to the engineer's profession to enable them to work intelligently with the engineer.

While no one will dispute the desirability of broadening the vision of the graduates of these two schools, just how are we to accomplish it? It would appear that mental inertia has prevented revision of the curricula, though few will undertake to support an argument to the effect that it should not be done. Our zeal to build up separate colleges has been very strong. Students enter these colleges and after they have been able to obtain a certain number of credit coupons, and accumulate them as the zealous shopper does trading stamps, they are presented at the administration offices of the educational institution and the student receives a diploma. But the question may very well be raised whether he leaves with an education. In too many instances the students' activities have been confined too closely to the water-tight compartment of one college. We appear to believe that since this is an age of specialization, we ought to carry him as far as we can within a given field.

Even if we assume that this is an age of specialization and that it is, in part at least, the function of higher education to produce specialists, the question may be raised whether we are succeeding. In recent years the definition of a specialist, as one who knows more and more about less and less, is probably fairly close to the truth. A little reflection will show, however, that a true specialist is one who knows his subject from all important angles. This means, then, that the graduate engineer must know something more than the technical side of his profession. Lack of appreciation of the importance of certain fundamental problems of economics and business might mean the complete collapse of some project which, from a purely engineering point of view, was without a flaw.

If the implied reasoning in what has been said is sound, we have reached the point where the border land field between the schools of engineering and business should be cultivated with the greatest care.

As one interested in business education, I care very little whether a man takes a diploma from a school of business, or from a school of engineering. It is idle to waste our time arguing that the future executives are to come from the new schools of business, or from the old schools of engineering. Anyone who has given any serious study to the industrial and commercial development of the United States within the past generation knows that the future executives will come from both of these schools. But since the world is not so accommodating as to present to these graduates problems which involve only engineering problems, or business problems, nicely segregated and all ready for the laboratory solution, it would seem that the border line fences between these colleges ought to be provided with a series of gates, so that students may pass from one field to the other to such an extent as will enable them to obtain a broad view of the problems of their own field and to leave our universities with an education as well as with a diploma.

Assuming, then, that we should broaden out the offerings for students in both colleges, what problems in curricula reconstruction does such a theory of education present?

Some institutions have attempted to answer this question by setting up certain combination courses of engineering and business to which but four years are devoted in the two fields. These curricula are given such titles as Engineering Administration, Commercial Engineering, etc. The limits of this paper will not permit a discussion of the merits of such curricula. Attention is here directed to what may be done for the student who desires to complete the regular curriculum in, say mechanical or electrical engineering, or one of the regular curricula in business.

It would appear that if we are to give the graduates of such curricula any perspective of the problems which they will confront after graduation, both colleges must curtail the number of advanced specialized courses to make room for some fundamental courses outside the student's major field. This for the great group of undergraduates will be a gain. It is impossible to give to a student through highly specialized courses an adequate substitute for actual experience. Neither the engineering school nor the business school can accomplish this feat. The laboratory of actual business and industry can never be reproduced within the university. If we had it all nicely set up on Monday, it would be out of date by the week end.

The elimination of some of our advanced specialized courses, for undergraduates, then, and the substitution of fundamental courses from the border land field ought to equip our graduates to teach themselves when they face the problems of actual life. If the engineer, for example, has not had a course in accounting, the gap in his intellectual spark plugs will be too wide for the spark to bridge it, and he will therefore be unable to bring about the effective correlation of theory and practice which would be possible if he had had only the elements of accounting.

We sometimes hear engineers say that they do not want engineering students to spend their time on the courses offered by a school of business. They contend that that is a line of study which the engineer can pursue on his own account after graduation. They argue, too, that mental discipline is best obtained through such studies as physics and chemistry, which yield an exact result and give the student something definite for which to strive. There is danger in pressing such reasoning too far. To repeat what has been said, the world is not so obliging as to present problems to the graduate engineer which can be solved in an exact manner. Very frequently problems involve a *judgment* as to *tendencies* and while it is not possible to secure a result that has mathematical accuracy, it often means success or failure to have exercised the proper *judgment* as to the probable *tendency* or to have been unable to do so.

In addition to the elimination from the undergraduate program of some of our advanced and highly specialized courses, it will be necessary in some instances for each college to offer to the students of the other college courses designed especially for those students. There will be some objection to this on the part of some of our faculties. Some accountants, for example, will say that accounting is accounting, and it is not desirable to have "accounting for engineers." Some members of the engineering faculty will want to insist on the whole list of mathematical prerequisites for certain courses in engineering, whereas a modification of the course so as to eliminate, say one-fifth of the course content, which makes it necessary to require a number of mathematical courses as prerequisites, would enable the students in business, who had a reasonable foundation in mathematics, to take the course with much profit. Examination of some of the engineering catalogs shows that what is here suggested is now being provided. The plan ought to be more widely adopted.

The student who is looking forward to a career as a certified public accountant obviously needs more work in the field than does the engineer who wants an understanding in the fundamentals of the subject. It is also true that the student who expects to be an engineer will need much more comprehensive courses in a given field of engineering than will be necessary for the student who expects to be a certified public accountant, or to go into business. It might very well be true, then, that a differentiation could be made in the character of certain undergraduate courses which each group would pursue with advantage to both, and which would provide adequate foundation for advanced courses and graduate work.

When we turn from the undergraduate courses in these schools to the graduate offerings we encounter some difficult problems in attempting to bring about a more effective correlation of graduate study and of projects of research. If proper consideration has been given to the fundamental courses of the undergraduate curricula, it will be possible for students to broaden somewhat the scope of their graduate work. Moreover, there would seem to be some possibilities for correlation of projects of research on the part of our faculties in guiding the work of graduate students. Is it not possible, for example, that certain graduate students in engineering might do well to broaden both the selection of graduate courses and their research so as to include the economic or business side of their specialty?

The investigation of the Society for the Promotion of Engineering Education reveals the fact that engineers believe that their students should receive instruction in economics in two ways. First, by taking courses in economics taught by economists. Second, by having their engineering courses "shot through and through" with economics by their engineering instructors. Is it probable that the second plan will succeed as it should until a larger number of engineering instructors are better trained in the economics of their fields? The same statement may be made about the teachers in schools of business in lines of work which have a close relationship to the field of engineering. Here, it would appear, arises the need for broadening the training of the graduate students of today if we are to have properly educated faculties in our colleges of tomorrow, or if we are to give them an adequate preparation for a professional or business career.

It will be necessary to make the training of graduate students in both fields to which reference has been made a major educational problem if we are to have any success with such correlation as has been suggested. At the present time a graduate student in engineering, for example, in most instances chooses both his major and his minor in the technical field, and his instruction and the supervision of his graduate study are entirely under a member or members of the engineering faculty.

It would appear, after a man has had four years of technical training in a college of engineering, that it would be more valuable in many instances if he were to give a portion of his time in his graduate study to the economic and business phases of his major interest. To do this effectively, it would be desirable to have joint seminaries for such students in which two or three members from the engineering faculty and also from the faculty of the school of business would participate. To this group a graduate engineer would make his reports throughout the academic year. He would have the benefit of the criticism of men thoroughly familiar with all phases of his investigation. It would offer an excellent opportunity for members of our engineering and schools of business faculties to become better acquainted with certain border land problems and to educate each other.

Men become "fossilized" or "old fogeys" whether they are inside or outside of educational institutions by getting into a rut. As men in our universities reach a mature age, there is a tendency for them to specialize somewhat more in their teaching and study than was the case in their beginning work, and consequently their "mental vision" suffers. They can be aided greatly by "bi-focal lens" in the form of such joint seminaries, which will give them a better vision of their own problems and also a clearer long range view of problems vitally related to their specialties.

An engineer, for example, interested in the technical problems of a given field, will have a tendency to overlook many of the vital economic and business problems involved in that field unless he is in touch with someone who is an expert in those phases of the problems with which he is concerned. It would appear that the joint seminaries here proposed would bring the engineers and the economists and instructors in business in touch with one another, so that both groups would profit by the arrangement.

At the present time, no institution, so far as I know, attempts to make definite provision for such joint seminaries. If anything of this sort is done, it is arranged by the instructors themselves as an additional burden to their already heavy schedules. If university administrators could see in this an educational problem of first importance, and provide that such joint seminaries be a very definite part of one's university duties, it would enable our institutions to turn out graduate students in the two fields who would be much better prepared either to become members of our faculties or to accept places of responsibility in industry and in business. But it may be argued that the number of graduate students is too small in most institutions to make such a plan feasible. It may not be wise for all institutions to attempt such a program. The arrangement in a liberal number, however, would be justified, and would doubtless induce more students in both colleges to pursue graduate work. It is even argued in some quarters that it is not possible to hold the best students —men who are to be leaders—for graduate study; that only the inferior men—probably those interested in teaching—remain. It is not comforting to believe that this process of selection is taking place, but if it is, the plan which is here proposed should by all means be inaugurated in all institutions which are likely to turn out graduate students who in turn will become the instructors.

If we consider for a moment the type of training which the group of students should have who do not intend to engage in educational work, it would seem that such joint seminaries, as are here proposed, would be distinctly worth while. In some instances industries and public service corporations are carrying out the plan of giving leaves of absence to young men of promise who need further study along a given line. Such a movement for continuation educational programs ought to receive all possible encouragement. In some instances the educational institutions provide for certain instruction and research in the laboratories of the industry itself. In the light of the attention which some of our public schools are giving to the gifted children even in the early grades, it would appear that there would be ample justification for a limited number of university professors to devote a portion of their time to such joint effort as is here proposed to guide the able students in graduate study and research. Provision for such "continuation training" in joint seminaries might possibly entice into educational work a few of the superior students who had escaped at graduation. If so, even the industries would be the beneficiaries of the plan in the long run.

In summary, it may be said that this country in its development needed first the assistance which could best be rendered by the technical and engineering schools. With the aid of these schools, however, we have witnessed such a development of American industry and business that very many new problems have presented themselves which, in turn, have brought into existence, mainly since 1900, a large number of schools of business. Careful analysis of the types of problems which present themselves to students who graduate from engineering and business schools shows that there is a need to give to both groups a perspective of the problems in both fields. This would appear to be feasible by curtailing somewhat rather highly specialized courses in undergraduate curricula, and by substituting fundamental courses, and in some instances special courses in engineering and business, thus making it possible to have further effective correlation of graduate courses and of projects of research. In the graduate work, university administrators have an opportunity to make a contribution to education of the first magnitude by providing joint seminaries in which graduate students in engineering and in business may make reports on their graduate study and obtain helpful criticism from men familiar with all phases of their investigations. This plan will not be of much consequence until definite credit is given for it in the teaching schedules of the faculty members who participate in it. Likewise, the continuation program here suggested would keep the instructors of both colleges in touch with men in the industries. It would vitalize our instruction and would aid materially in giving to students the broad point of view which the dynamic problems of our complex industrial and commercial life demand.

MAN differs generally from other animals in the power he has to conserve all his gains over nature. . . . He differs also from other species—and this must be said to be a second great advantage—in his ability to incorporate the new gains he makes into a cultural body of productive arts, so that each generation builds on the work of all those that have gone before. . . . When man takes what comes down to him from the past and goes on from that point, there is created an accelerating rate of accumulation for inherited technique. Each generation possesses more than the generation that preceded it, because it has been able to go on from the point where its ancestors left off. The rate of this acceleration has been the subject for considerable speculation, but no mathematical formula which covers it has been discovered. The rate of acceleration is really a joint function of man's intelligence and the body of materials, skills and knowledges which come down to each new generation. . . . Advance. . . . has to wait until the problems set by the gaps in our knowledge can be solved. Or at any one time the genius to go forward may be lacking and for a long period of time, perhaps, no new discoveries may be made. . . . Our increase in productivity at the present time is in great part traceable to the advances we have made in the accumulation of skills and knowledges and in bringing intelligence into contact with relevant problems. (Rexford Guy Tugwell, *Industry's Coming of Age*, pp. 70-73.)

Management Psychology a Joint Responsibility

Out of a New Co-operation Between Business Executives and Psychologists Can Emerge a New Practical, Scientific and Successful Technique of Human Engineering

By E. HAYDEN HULL
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THE business executive has as much brains as the psychologist. This seems to be unanimous. Major executives with whom I have talked admit it. Recently, leading psychologists have stated that "some of our business men are among our best psychologists." The score seems to be about sixty-eight even on the first round of medal play.

The game is still going on, however, seemingly between more—or less—friendly antagonists. The sociable nineteenth hole would be a much better place.

The vice-president of one of our large manufacturing corporations was sitting behind his desk recently, wearing a blank look. Across the desk sat a quiet little man who was explaining how a psychological approach to the company's employment problems would save money. Suddenly the executive waved his hand. "Too theoretical," he announced decisively. And that was all he would say. The psychologist walked out. "Obtusely practical," was his later comment.

They may both have been partly right; more probably they were both mostly wrong.

Certainly the psychologist is theoretical. He has to be. He deals with the principles and operations of the most complex and intangible thing in the world—human nature. But he is hardly also impractical. In laboratory and field he is developing instrumentalities to appraise and measure human nature, and show the executive how it can be used to the best advantage.

Certainly the executive is practical. He must get material results. But he is also a great judge of human nature in operation. If he is not he does not get to be a major executive. Business is men doing something. The executive manages the men. That means that he makes his success through studying and handling the same intangible human nature as the psychologist. Perhaps we shall have to call him theoretical too.

He would probably vigorously disclaim it. However, the reasons he gives for hiring, promoting and firing his men often read like a psychologist's note book. Human nature is the same study, whether you call it psychology or executive management. Perhaps after all, the lion can lie down with the lamb—whichever is which.

Before they can do it, however, in true amiability and understanding, the executives must take a more careful look at the human nature they handle so well—and analyze in detail rather incompletely.

The mutual difficulties in the past have been at least partly due to the fact that the executive world has not informed the psychologists exactly what it needed from them, and in what terms. This has not been because executives could not tell, if they tried, but rather because they did not recognize the necessity for taking the required time and effort to assemble the information. They have been doing very well with practical methods based on experience and observation. More recently, however, some of them have begun to suspect that they could do still better. If there were some more definite and scientific way to appraise human nature in its actual details, it would give them a useful knowledge of all the parts of the human instruments they are using.

You can buy your neighbor's car with fair assurance that it will run, because it ran when he drove it up to your door. You can drive it without knowing a carburetor from a poppet valve. But if something goes wrong with it, it is taken where it should have gone in the first place—to the man who understands the machinery itself. Detailed understanding of individual men is no less important to at least someone in the organization, if management is going to achieve its greatest possibilities with them.

Of all the arts and professions, business (and it is both) has made the most comprehensive use of the findings of material science. Machines and operations have been brought to a level of efficiency which is the envy of the world. Any executive will probably admit, however, that his man power is not as well understood or as efficiently operated as his machine power. This is natural. It has not had the same amount of scientific analysis and co-ordination.

Here is where management can profit from appropriate measurements by the psychologist. But it is up to the executives to tell first exactly what they want measured. In fact they must find out themselves. To do this they must scrutinize, in a new analytical spirit, the details of their own past experiences with human nature in operation.

I think it is fair to say that the psychologists have so far made the greater number of friendly advances toward a new entente. The spirit of the scientist or professional man is, before anything else, that of service. He sees that accurate and scientific appraisal of human nature will help the executive to manage effectively, and will increase the profits of the business. The right man in the right place is at least as important as the right machine. Effective machines have made industry what it is. The next step has to do with men.

Both sides know this, but they have not been able to get together very successfully on an operating basis. The materials and forces in this new human engineering are not agreed upon. As psychologists are, or will be, in a position to furnish the calipers and dividers, the formulae and analyses, when they once know what is to be measured, business has by all odds the most to gain from a new partnership. Business is built on bargains for profit. It will accept this one.

If we may be allowed to anticipate the articles of agreement, they will provide: first, that executives shall set forth the list of human characteristics which, in their own working vocabulary, are the simplest and most definite to use in connection with hiring, firing, promoting and adjusting men. As executives are admittedly as successful practical psychologists as the psychologists themselves, the latter can hardly object to this pragmatic list as a substitute for whatever one they may have themselves selected. They are sincerely anxious to be of service to business; they will undoubtedly be willing to yield a few points in this matter if necessary.

The second article will provide that psychologists shall do the work of the next step. This means that they will adjourn to their laboratories and experimental fields, and work out the tools for appraising these characteristics in detail. It will be their task to develop means of measuring the presence or absence of the qualities and abilities that the executive wants to know about in his employes. This will be the first time that the psychologists will know exactly what executives need. The executives, in turn, will be in the way of getting a considerable body of psychological data which they will feel that they can utilize effectively.

The third article will provide that when the tools are ready, business will give the makers a chance to try them out in practice. This is only fair. When they are finally adjusted, the makers will then show the executive how to use them for his particular purposes; and will help him with the technique if desired. Nor is this all that business gets, as will appear later.

The first step, then, seems to be up to the men who will get the most satisfaction and prestige from an improved technique in human engineering, the executives whose business it is to make management successful.

Of course there will have to be volunteers. You cannot get all the executives in the United States into one room. Furthermore, large groups do not generally come to any definite conclusion. If you doubt it, go to a business convention. But a small group of men who have the authority on human nature born of actual successful experience in handling it, can get results. That is an executive habit.

Having presumably put the executive to work first, it may be interesting to see what his job involves. He must make out a list of human qualities for the psychologist but obviously he cannot hand him all the terms he uses. There are hundreds. Worse, most of them have ill defined and overlapping meanings. The executive uses them casually every day, but they mean one combination of qualities at this desk, and one not quite the same in the next office. His job then, is to select those terms which are, in his own vocabulary, indivisible into simpler terms, and are capable of reasonably consistent definition. For our present purposes we shall refer to these as "basic."

Perhaps an example will clarify both what the executive must do, and what it will mean to him when he gets it done.

"Initiative" is a much abused word, and we will follow it through our discussion as an example typical of many. It is rated as "desirable" in a president, a clerical department head, a construction boss. Yet nobody would claim that exactly the same brand of initiative is required in each. And the psychologist would have to throw up his hands in despair if asked to develop a single scientific measurement for this quality. It has too many variations.

But the case is not hopeless. A group of successful executives sitting together and pooling their experiences and observations, would probably agree without much argument that in business and industrial practice the word is used to designate various combinations and expressions of four different human characteristics. They would probably also agree that in their own daily usage, these four are indivisible into any simpler terms. That means that they have started their list of "basic" qualities for the psychologists to work on. Some psychological theories may seem to be outraged before this list is finally complete. To the executive it does not matter. When it comes to theories, psychologists do not always agree among themselves. The executive may therefore be permitted to choose those which fit his actual experience best. If psychologists are to be of most constructive help to the executive, they will have to see with him eye to eye—even though some may feel obliged to turn and give a sly wink occasionally to their colleagues. Perhaps in the end these will find that the executive knew as much about the practical functioning of human nature as they did.

Be that as it may, the first of the four factors in initiative which the executives would probably pick out is self-reliance. A man does not "initiate" much without it. It is not enough by itself; and its necessary amount and relative importance vary under different circumstances. But it is there. And these executives will hardly be able to think of two or more simpler terms in which they can express it. It therefore goes in the "basic" list.

Some of my psychological friends may here rise to ask a question. How are they going to be expected to develop a means for appraising a thing which has so many different objective modes of expression? Self-reliance in sports, for example, has quite a different expression from that evidenced in a business conference. And every expression is affected by a host of past mental patterns and present thoughts and emotions; it does not act freely and alone.

The answer suggested is, briefly and without going into technical details, that the psychologist find ways of evaluating the man's *average level* of self-reliance—his normal habits of self-reliance, if you will, or perhaps his temperamental predilection for it. These will be revealed in the man's past history, as well also as by additional tests which may be devised. The executive does not have to be told that the man's special interests may tend to increase its action in a particular case, or that unfavorable conditions may inhibit its expression almost entirely. What he wants to know is the raw material, so to speak, which he has to work with; he will assume the responsibility for bringing it out to the best advantage. The trouble now is, very often, that he has not this knowledge. He is therefore obliged to make guesses. He may expect too much of one man and fail to take advantage of the capacities of another. But he believes thoroughly that men tend to run true to form. Instead of experimenting, he wants to know what that form is likely to be. This the psychologist will be able to tell him, much to the satisfaction of both and to the benefit of the man in question.

Second among the factors in initiative our executive group would probably select fighting spirit. This is the old primitive love of combating dangers or obstacles or what not. And the expression of initiative presupposes obstacles of some kind; if there were none, the affair would simply be a procession. As between different jobs, the amount of fighting spirit required would doubtless be more variable than in the case of self-reliance; but it is often highly important and must be included as typical.

The third basic factor is energy. It might be said that a considerable output of energy is necessary to accomplish anything at all. It is. Also one may say that energy has an almost infinite variety of expressions, and these in turn vary greatly under different circumstances. True. What we mean here is again the *average level*. "What is the man's normal expression of dynamic power?" is the question, as far as the man himself is concerned. When we find one with a great deal of energy we recognize immediately, from our own daily observation, that he is more likely to display initiative than is the man with a small habitual energy output. We must venture, therefore, to include it among the typical factors.

The fourth factor in initiative—the first in some instances—would doubtless be constructive imagination. If I hear a murmur here from the psychological side of the house, it is not surprising. May I attempt to make peace in this quarter first.

The executive does not demand that he know all about the imaginative powers of an individual. Nor is he interested in theories of what imagination is anyway. For his general purposes in the beginning, he will usually be satisfied to know this: whether the individual has indicated the capacity for constructive and creative thought in dealing with one or more of the major fields—ideas and symbols, things and their operation, people and their relationships. Later, as techniques improve, he will ask for methods of appraisal in subdivisions of these. To him in any case, constructive imagination is a special and limited ability under the particular circumstances requiring it. As such, its average levels or even specific functionings can doubtless be appraised in whatever degree of detail may be agreed upon.

As a factor in initiative, it will necessarily rate higher under some circumstances than others; but we can hardly initiate without it. Unless we have constructive ideas in a situation requiring them, someone else has to tell us what to do, and show us how to do it.

By a rather laborious process, perhaps, we have worked out something of the probable thoughts of a group of executives as they focused their accumulated experiences and observations on the content of initiative. It is possibly neither necessary nor desirable to give further examples here. The process, as outlined in this case, has doubtless done the executives an injustice in the matter of time consumed. A few brief mental searchings, a few interchanges of experience, and they have arrived at their conclusion. They know what this and similar complex words really mean to them in simpler and more definite terms.

In fact, in our common experience, individual differences seem most clearly expressed in these simpler terms. We recognize, quite specifically, the qualities they designate, and count on them very confidently in various people. If a man generally known as self-reliant turns weakling in some situation, or a "good fighter" turns coward, we are surprised. We look for consistency in these elemental qualities. But if a man displays initiative in some things and not in others, it is no more than we expect. The word applies to too many kinds of situations, and in too many variations. Some of these simply do not "interest" the man; or he may not "have time" to go through with the whole procedure involved. But when he is sufficiently interested to undertake an activity involving initiative, his normal self-reliance and fighting spirit come into play. Then we expect these of him, and are seldom disappointed. The latter are quite distinctive and persistent personal attributes. Initiative, as a term, is decidedly indefinite and variable.

The executive, then, will dissect such terms and build up his own "operating" vocabulary. In this he will not be afraid of using the results of common business and industrial experience. His items will be relatively simple, and quite characteristic of the individual differences with which he customarily has to deal. This is exactly what he started out to get.

The next step is up to the psychologist. His share is to develop methods of detailed appraisal and measurement for these human qualities.

Perhaps we should stop for a moment to see how our typical analysis works out in practice after we get it. If it is correct it should illuminate and differentiate the meaning of initiative in each particular case considered. We should expect to find the individual factors present in varying degrees and orders of importance. Otherwise the term would always mean the same thing and there would be no object in subdividing it.

In a typical case of the president of an industrial corporation, for example, we should probably agree that all of the four factors are desirable in an unusually high degree. A proper job analysis would, however, disclose a rather definite order of importance, probably this: (1) self-reliance; (2) constructive imagination; (3) fighting spirit; (4) energy.

Imagine a typical highly successful president without self-reliance! Even his secretary would have him under her thumb. And this latter eventuality is sometimes harder to escape than people think.

Constructive imagination in the second place is almost equally important. Initiative in the successful conduct of modern business requires a veritable brain factory of new ideas and resourceful methods. Like the fish ponds of our boyhoods, a business that stagnates gets weedy.

Third, give me the executive who loves a good fight. Not that he should be a claimant for pugilistic honors, or be anything but suave; but he needs fighting spirit if he is going to show effective initiative in the savage competition of business today. The reputation for being a "good fighter" is both a weapon and a defense.

Energy is placed fourth. This is not because it is unimportant. Most executives arrive because, among other things, they have shown more of it than their competitors on the way up. But while it is a dynamic factor in his initiative, it is not so distinctive as in the erection foreman, for example. The president may be off playing golf; but tne organization knows that the voltage is there when needed on the job.

This, we may say, is the initiative of our president. By way of contrast we might look in on one of the minor clerical department heads. Obviously he does not need to rate as high as the president in any of the factors. We should also expect some other differences. As we study his job, it appears that if he is going to display any initiative, the first thing he needs is ideas—constructive imagination. Instead of being number two, as before, this is number one. Both its power and position have changed. About the only things this man can "initiate" in his job are new ways of doing old things, or old ways of doing new things. If he hasn't the ideas he doesn't do either.

Second seems to come self-reliance. This has moved down a step. Executives—or anyone—can hardly display initiative without having at least a fair amount of self-reliance. But if our department head did not have the ideas to lead it into intelligent expression, he would be merely forward and bungling. On the other hand many a good idea has gone to waste in the owner's mind because he hesitated to push it out into the field of action.

Now we seem to be in difficulties with our schedule. We have two factors left and no call for them. This is another interesting evidence that instead of saying "initiative" we must say "kind of initiative" and then analyze the kind. The particular variety for this job needs neither superabundant energy nor aggressive fighting spirit. Either would be apt to break loose at the wrong time.

Energy is needed, it is true, but too much native or potential energy will tend to make a man restive under the restraints of a clerical position. Fighting spirit should probably be actually negative. Interdepartmental functioning, as well as the successful running of a subordinate department itself, usually calls for below average rather than above average of this quality. We all know men who are decidedly combative by nature, who nevertheless manage to hold down these positions without any very serious eruptions while they are on the job. It is sometimes an evident struggle, however, and it is a question whether they would not be happier if they were given a place where they could fight some real obstacles, and the old job delegated to someone more temperamentally adapted to it.

In passing, this example is a reminder of the importance of negative factors. Every man has "normally" too much or too little of some qualities; as in the man who was described as "the most even tempered man in the world—always mad." These negatives must be among the things considered in giving a man a job.

Two other examples of initiative must necessarily be summarized very briefly. The lieutenant of firemen is apparently a case where fighting spirit is at the spear-point. This is in decided contrast to the clerical worker. Following this seem to come energy and self-reliance. In the case of an erection gang boss, initiative seems to lead off with energy, at least in those cases which have come under personal observation. The supine boss simply does not get his other initiative factors "over." Following energy seem to come fighting spirit, self-reliance and constructive imagination, in the order named. As in all cases, however, particular conditions may change the order and importance of the ratings.

These examples will perhaps serve to indicate the utility of our analysis of initiative. They illustrate the fact that this, like so many similar terms, is not a safe word to use for accurate description. Its real meaning varies with different situations. But if we say that it is self-reliance, fighting spirit, energy and constructive imagination in some particular degree and combination we have rather completely defined the requirements in a special case. We have begun to give the executive a more accurate way of analyzing men and jobs; and we have given the psychologist a list of "basic" human qualities whose average level he will be able to appraise or measure with fair accuracy. He is obviously almost helpless before such a nondescript term as initiative.

My friends the executives may here object to exchanging one word for four. They feel that they have too many terms now. Actually, however, they will find that they have fewer words in the end. There are, for example, perhaps a dozen words which denote various manifestations of self-reliance under different circumstances. But given a man's "average level" of the basic quality, the experienced executive fits it into the total situation of the job, seemingly in a moment. He has considered the man's probable general attitude, his working under the direction of the particular boss, his accepting necessary responsibility, his presumable relations with his associates, his superiors and his subordinates, and so on. If there is a misfit, he has picked it up. By having a "key" word he has not had to match the man up with a mass of detailed verbiage describing each situation. He has not confined himself to the effect of self-reliance on a man's initiative, but has applied it to every appropriate situation in the job. That element is finished.

Similarly an appraisal of a man's average levels of energy, of fighting spirit and other basic terms, will give him immediately keys to a dozen or a hundred different situations likely to be found in the position.

In the end, he has not only reduced the number of his terms, but those which he does use are simpler, more widely useful and more clearly defined. None of these are new to him. He uses them now. But he can utilize them more fully and more effectively than he has in the past, especially when he can get rather definite measurements for them in the individual.

The psychologist, in turn, will avoid a hopeless morass of uncertain meanings and vague aims. With the executives' list of human characteristics and their definitions in hand, he can repair to his laboratory and go to work with considerable satisfaction. He has objectives in research which are definite, and dictated by practical experience. The results will be immediately and profitably usable. Also much of the work is in the field of the emotions or "affective" qualities in which he has been groping for something solid for some time. He may doubt the wisdom and accuracy of what the executives have handed him; that part of the list may not conform to all his present conceptions of what the emotions are, or how they act. But executives seem to know how they generally operate in industrial practice. Their ideas are worth considering.

Fortunately the psychologists can assuage some of their doubts with the certainty that they will eventually have available fairly objective measurements of the results of their work. When their instruments of appraisal have been in operation for a time in industry, there will be a great number of cases where their validity has been demonstrated by events. On many of them they will doubtless have the opportunity to make further scientific studies. As soon as executives find that some of their human problems are being simplified, their co-operation will be both full and enthusiastic.

A certain foreman is to be chosen. The executive in charge knows that (to take one item) a high level of self-reliance is required on the job. The psychologist appraises the candidate's average level of self-reliance and reports that it is high. Industry has at last gotten the sort of answer it wants from psychology. In the end psychology has become a producer—a producer of human efficiency and satisfaction, and therefore of profits.

In the process of arriving at this mutually agreeable situation, I do not see any other way for business and psychology to get together successfully but in terms of these "basic" human characteristics. They are both effectively usable by the industrialist and fairly appraisable by the psychologist. They furnish the best basis so far apparent for the two to combine in an intelligent approach to the human problems of industry.

Furnishing the original list may at first seem to management like too "theoretical" a problem to undertake. On the contrary, it resolves itself into a catalogue of experience. If executives will once take the trouble to set down in detail what a sufficient number of complex words like initiative really mean, in their own practical experience and observation, the problem is in the way of being solved. They will also find terms like "cautious" and "systematic" which may not have previously appeared in combination, and are themselves indivisible, at least in their own operating vocabulary. In the end there will appear a working list of relatively simple and basic human attributes as they appear clearly in action. These are the common meeting ground.

In summary, it may be said that executives are the ones to take the lead in this approach to the problems of human engineering. They have few or no preconceived psychological theories to wrestle with. They handle men successfully in a multiplicity of situations. They are, from practice born of necessity, among our best judges of human nature and how it actually operates. It therefore appears logical that they should be the ones to dissect human nature for the purposes of a more practically operable industrial psychology.

But when they have dissected it, they have no instrumentalities for measuring each part accurately. They may have a new and illuminating perspective, but they are still obliged to guess at many of the details. Here is where the psychologists can render real and practical service. Measuring human attributes is part of their business. They would already have developed means for measuring more of them if they had been told exactly what was wanted. With the new executives' list of items required, they will shortly be in a position to supply many of the missing instrumentalities of measurement. These they will show management how to use, or will work with management in applying them. A new accuracy in human engineering will begin to appear.

All this will not be completed in a week or a month. Scientific progress is almost inevitably laborious. But each step will be appropriate and in the right direction. Meanwhile a few useful instrumentalities have already been worked out in some detail; and a good many human factors can be approximated fairly well for present operating purposes. The matter need not be allowed to remain at a standstill.

In the beginning, at least, the applications will seem somewhat technical in both directions. The situation appears to suggest the development of a new profession, half psychological and half industrial engineering. This will function as a link between the psychological laboratory on the one hand, and management on the other. It will utilize the knowledge, experience and methods of both. The busy executive cannot be expected to work out the details of applying the new methods, particularly where large bodies of employes are concerned. He wants the final answer to a human equation, which he can then use as he sees fit. The laboratory psychologist, on the other hand, cannot be expected to analyze the industrial and human situation in each job in each plant. What he can do is to furnish better tools to work with, in appraising the relative strength of various human characteristics. The new staff officer of the particular plant will then take these and apply them as indicated in each individual case. The jobs will have been analyzed in human terms as well as by operations and environmental conditions. The new methods of personnel appraisal, added to the best of the old and applied to the seeker for employment, relocation or promotion, will then enable a new and clearer estimate to be formed of the mutual suitability of the man and the job.

The operating executive, on his part, will find that with his basic list of qualities and the new tools of appraisal, he can cut several ways. Not only will his executive supervision of employment, relocation and promotion be made easier and more effective, but also other benefits will appear. Job analysis will resolve itself more readily into a matter of "human requirements" in addition to the present list of material operations. The training and development of individual employes will be made more effective; for their particular capacities and characteristics will be better understood. A new method will be opened up for analyzing rates of pay; jobs can be rated, for example, on the relative amounts of self-reliance and of creative ability required. The use of rating scales will be simplified and illuminated; rating scales are already expressed mainly in human terms, but too indefinitely. And considerable light may be thrown on incentives and on various factors in industrial relations problems. From every standpoint the enterprise seems desirable, and capable of far-reaching results.

In the past, the executive and the psychologist have not spoken exactly the same language nor had a fully common meeting ground of experience. There is no reason, however, why, with more mutual interest and forbearance, they should not come to terms. Out of a new co-operation can emerge a more practical, scientific and successful technique, not only in the human engineering side of industrial management, but also in the comprehension and adjustment of all human relationships.

News of the Sections

Central New York

On March 30, Walter Drey, Vice-President and Advertising Director of Forbes Magazine, spoke to the Taylor Society group in Syracuse on the subject "What a Production Man Should Know About Advertising." At the meeting on April 27, F. L. Sweetzer, General Manager of the Dutchess Manufacturing Company and well known for his writings on management subjects, will speak on "Humanizing Standard Costs."

New York Metropolitan

At the February and March meetings of the New York City group, the subject of "The Interrelation of Finance and Scientific Management" was further developed by L. F. Musil, Director of Finance of the City Service Corporation, and by Q. Forest Walker, Economist and Investment Banker for R. H. Macy & Co., Inc. Mr. Walker's able address on the interest of the investment banker in scientific management appears in this issue of the Bulletin.

On April 19, Spencer Miller, Jr., Secretary of the Workers' Education Bureau of America, outlined some of the newer developments in the American labor movement, stressing especially developments within the American Federation of Labor. An interesting discussion, in which representatives of both the labor and the manufacturers' groups participated, followed his address.

Southern Tier.

The March meeting of the Southern Tier Taylor Society members was addressed in Elmira by Arthur L. Mann, Superintendent of Industrial Education of the New York State Department of Education. His subject was "Reducing Production Costs." At the annual meeting on April 23, Carl Killinger, who has just returned from Australia where he has had an opportunity to make interesting observations on business conditions in that part of the world, gave an informal address.

Reviews

Elementary Economics. By Fred Rogers Fairchild, Edgar Stevenson Furniss and Norman Sydney Buck, The Macmillan Company, New York, 1926, 2 Volumes, Vol. I, pages xviii, 168; Vol. II, pages xiii, 661.

These two volumes, according to the authors, are emphatically stated to be a textbook "for the purpose of helping college students to a knowledge of the fundamental facts and principles of the economic world in which they live. That is the sole purpose of this book. Our contribution to economic theory, if anything at all, is slight. The book is not written for the edification of the mature student of economics. It is strictly a book for beginners and the teachers of beginners."

This text has already been adopted by a considerable number of institutions which are seeking to make fundamental economics clear to an indifferent student body. Its strong point is in its discussion of the practical problems. It is not as effective in the presentation of economic theory (for example, value) but it is undoubtedly a useful addition to the field of college texts.

Herman Feldman[1]

International Trade. By F. W. Taussig, The Macmillan Company, New York, 1927, pages xxi, 425.

No field of economics has received more attention from economists during the past decade than that of international trade. Indeed, statesmen, politicians, business men, laborers, farmers have had numerous opportunities to become aware of the economic relations of the United States with the rest of the world. The War proved disastrous to many systems less delicately attuned than the world's economic organization, but nowhere, I dare say, were its influences so quickly felt, so widespread and so disruptive. In an attempt to understand these changed international economic situations there has been a vast amount of speculation upon the many problems which have developed. Much of this speculation has found its way into print—some of it unhappily, but this most certainly cannot be said of the present volume. Professor Taussig is one of the foremost American economists and in his special field, international trade, he is pre-eminent. The present work will make more certain his leadership.

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[1] Assistant Professor Industrial Relations, Amos Tuck School of Administration and Finance.

The volume is divided into three parts. In the first, Professor Taussig expounds the generally accepted theoretical explanation of international trade. In certain of his amplifications of that theory he answers some of the criticisms which have recently been levied against the classical exposition. In the second part the author attempts to discover how far actual commerce between nations takes place in accordance with the theory presented in the earlier section. Part three is reserved for an examination of the changed character of international trade when it takes place between countries with different monetary standards. The author's discussion of dislocated exchanges includes certain exceptions which he takes to Cassell's theory of purchasing power parity.

Professor Taussig distinguishes between the three kinds of differences in cost—absolute, equal and comparative differences—and in each case attempts to discover what he calls "the barter terms of trade," that is, the quantitative relation between the physical amounts of commodities exchanged. The simple and unreal assumptions with which the author starts are modified by the introduction of factors which give to the exposition a reality which at the outset was completely absent. How is trade between countries influenced by the level of money wages, by the existence of non-competing groups of labor, by capital cost, by varying costs—diminishing returns and increasing returns?

The author then considers the influences which are exerted upon international trade by those items in our international balance sheet which during the past few years have become increasingly important—payment of indemnities, tourist expenditures, loans and interest charges, and freight charges. Finally the duties upon imports are considered in their effect upon the barter terms of trade.

In Part II, which treats of the problems of verification, Professor Taussig tests his hypothesis by observation. The reader will, I am sure, readily understand why "the task of verification and correction has constituted the most laborious and difficult portion of this book"—a task made more difficult by the inadequacy of the available data. Yet many familiar facts of international trade are in accord with the theoretical deductions; the relation of exports and imports and the tendency towards an equivalence of money values between them when the non-merchandise items are considered. Countries trade with one another and extremely wide differences in wages and prices continue to exist between them.

Two industries receive equal protection. One flourishes, the other does not. Why? Human causes or physical causes or a combination of the two make one an effective industry and gives to the duty levying country a comparative advantage in the production of the one commodity. Where these favoring conditions are absent, protection rarely, if ever, brings into existence a flourishing and self-reliant industry. "For my own part," says Professor Taussig, "it is prolonged inquiry on the working of protective duties in the United States which has confirmed my conviction that the actual course of industrial development and of trade between nations affords a striking verification of the essential features in the theory of international trade."

The mechanism of international payments has recently bulked large in the discussion of international trade. But not always has the relationship between these payments and the more fundamental problems been considered. How do specie movements influence prices? Many factors influence the sensitiveness of prices to specie movements and the ultimate domination of prices by these movements. Professor Taussig reviews the monetary and banking systems of the leading countries to determine their relative sensitiveness to specie inflow and outflow.

The author then turns to a study of the trade balances of Canada, Great Britain and the United States to determine wherein the theoretical deductions are supported by concrete phenomena. Frequently he finds partial confirmation only, but this is not surprising because at any particular period the events are complex, the fluctuations in political and economic influences are many and abrupt, and it is extremely difficult, if not impossible, to single out the effects of any one of the forces which normally act on international trade.

Professor Taussig's prophecy in regard to the future of the trade balance of the United States is worth quoting, not merely because it is interesting and important, but also because nothing else indicates quite so clearly the vast gulf which separates the careful utterances of a scholar and those of an individual who, knowing little of the intricacies of the subject, settles all the problems to his own satisfaction, tossing them off with an air of impatience at the stupidity of economists who refuse to agree. "The export of capital may wax and may wane. . . . The great excess of merchandise exports over imports may continue, or may be succeeded by an even balance, or may be replaced by an opposite relation—an excess of imports. The whole balance of international payments, with all its interwoven and conflicting elements, subject as it is to the possible decline or growth of almost every item, may take a shape quite beyond any foreshadowing. . . . By what processes will the currents of international trade be influenced? It may be presumed with confidence that the fundamental actuating forces in the movement of merchandise will still be the prices of goods in the several countries, and the relative levels of their domestic prices and their money incomes. But just how the prices of American goods, and the country's general level of domestic prices and money incomes, will shape themselves or will be shaped under the newly developed banking and currency situation—he would be a rash man who ventured to predict. And hence he would also be rash who ventured on a prediction as to the ultimate structure of the country's international trade, of its merchandise exports and imports, of its balance of payments with other countries, of the greater or less extent of its real gain from the total of all the transactions taken together."

J. L. McDonald[2]

The Economics of Instalment Selling. By Edwin R. A. Seligman, LL.D., Harper & Brothers, New York, 1927, Vol. I, pages xii, 357; Vol. II, pages 623.

The full title of this monumental work is "The Economics of Instalment Selling. A study in consumers' credit with special reference to the automobile." Instalment selling is given its appropriate place among other forms of credit and credit institutions as applied to practically all kinds of goods sold by this method. The treatment of the applications of instalment selling to automobiles is exhaustive.

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[2] Dartmouth College.

Professor Seligman, who is MacVickar Professor of Political Economy in Columbia University, assisted by a group of trained and expert economists and investigators, gave more than a year to this study. The results are presented in a most interesting manner. Its conclusions are well supported and seem inevitable. Discussions on the subject of instalment selling will henceforth have to begin with Professor Seligman's work and many will find the end of their discussions as well in these books for some years to come.

The first volume is divided into two parts. The first defines instalment selling, outlines its history, describes the methods used in the various lines of merchandise generally sold this way, and the extent of instalment selling. Part two analyzes the nature of instalment credit, identifies it as a form of consumption credit subject to all social standards applying to any other form of consumption credit. There follows what is without doubt the best statement of the nature, effects and tendencies of consumption credit. Separate chapters show the effect of consumption credit in the form of instalment selling on the consumer, on business generally, and on the general credit structure.

The second volume presents detailed reports of the studies and results found in relation of instalment selling to real estate, to consumers, to merchandise, to dealers, the problem of repossession, and the probable effect of a business depression on instalment selling. A mass of detailed information is presented on each subject. From this information the author and his associates have directed the attention to what is essential. The conclusions seem decidedly conservative.

Instalment selling is one of the most outstanding large scale business developments of the last five or six years. Although the methods of instalment selling are not new, as is clearly pointed out in this work, they have spread rapidly and have been adopted widely during this recent period. Naturally every one interested in this phenomenon of business has wondered and speculated on whither this method of business might carry us. Opinions have been very much divided. There have been persons and interests strongly partisan for instalment selling. There have been others equally strongly opposed. The views expressed have been largely merely opinions. It is too much to be hoped that this work will settle the discussion, but it will certainly place a wealth of fact and logic at the disposal of those who would like to go deeper than opinion and guess.

Professor Seligman in this work arrives at a general conclusion favorable to instalment selling on goods that may be wholly paid for by the consumer before their consumption has been completed. With many exceptions noted, he finds the effects of instalment selling highly favorable both to the individuals and to society. He anticipates no serious future problem arising from this method of selling. He credits the business advance that has occurred during the past five years, in part, at least, to the widespread use of this method of selling. Certainly automobile distribution would have been very much limited were it not for sales on the instalment plan.

There will be critics of the work presented in these volumes, but it is to be hoped that those who criticize will take the trouble to read the facts presented as well as the conclusions as stated before making their criticisms. It is also to be kept in mind that the applications of this work are made particularly for the automobile industry and trade. Advances in the knowledge about instalment selling are likely to be made in the other fields of consumer goods as time goes on, but for the present and probably for some years, this work will stand as the authority.

Paul H. Nystrom[3]

Principles of Selling by Mail. By James Hamilton Picken, A. W. Shaw Company, Chicago, 1927, pages vii, 374.

This is not a particularly important or interesting book, and I question if readers of the Bulletin would get much value from it. There are, of course, worthwhile ideas in its pages—an attempt to classify "letter-forms," as for example story letters, announcement letters, invitation letters; a discussion of seasonal and general conditions as important factors in judging returns from circular letters; a tabulation of returns, where different propositions have been offered by mail, which might be of tremendous value if all the facts were given on each; and a few brief suggestions on readability.

There is a very full discussion of what *not* to do in letter-writing — don't arouse hostility, don't omit important facts, don't confuse the reader, etc.; but the positive virtues of enthusiasm, vividness, and strategy in appeal to buying motives are dismissed in casual paragraphs. The author evidently does not believe much in them; for neither his text nor his examples show enthusiasm, vividness, or appeal.

In fact, most of what has been said in these 374 pages has already been better said elsewhere.

Moncrief H. Spear[4]

Testing Before Investing. By Edmond E. Lincoln, The A. W. Shaw Company, Chicago, 1926, pp. 96.

The distribution of our national wealth is constantly changing and bringing about new ownership. Most socially minded people are beginning to realize that this shift to new and more hands is a dangerous phase of our financial development unless it can be made cautiously. Advice from those most competent to give it is therefore essential. It is for this reason that individuals in the financial and academic world have set about finding means whereby the savings of men of modest income can be stored away to secure the highest return possible with safety. The suggestions in the book under review should prove helpful to both indivdual investors and investment organizations offering advice to others.

The book, brief and to the point, is not weighted down by academic traditions. It has no superficial material; one can turn to the type of investment in question and secure there the opinion of the author. Opinion only it must be, for our economic structure has the habit of every now and then turning a queer trick on the investor—a trick that even the statistician finds it impossible to cope with, although he would frequently lead us to believe he can. This situation will remain unchanged, for investments are deals in futures, concerning which man is yet powerless to predict with any degree of accuracy. Nevertheless, since the best investment advice can be no more than opinion it is the more important that the opinion be formed by one experienced in the field of finance and business.

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In one respect the author has fallen short. If investments are to be sound and the wealth of individuals thus well guarded, the organization to which indivduals entrust their surplus funds must be sound. This is essential to the interest of social and economic justice and the sustaining of our commercial structure. In my opinion Mr. Lincoln does not make enough of this point. We must first make investments secure by having business well organized, well managed and conservatively financed. Mr. Lincoln does not show how to go back of the securities as I believe he should have done. Nor does he show how to advise in the turn-over of securities. Who is to do the advising? On whom can one depend when he wishes advice on this matter?

These criticisms are not meant to detract attention from the valuable phases of the book. The contrary is the case, since the phases of the subject omitted here are well covered in Mr. Lincoln's "Applied Business Finance," also published by the A. W. Shaw Company, which can be read with profit by the investor. Many ideas included in that very fine piece of work might also have been incorporated in this volume to make it more comprehensive.

"Testing Before Investing" groups in a common sense way the classes of investors and deals with each in accordance with its important features. The ample space and sound thinking given to discussion of different types of securities, their strong and weak points and the type of investor each should fit, are most valuable, coming from Mr. Lincoln, who has had an opportunity to view the mechanics of business organization and administration at close range. In this respect the book makes a distinct contribution to the already too abundant literature of an elementary and pedantic type on finance and banking. A new field is being charted here which needed to be marked out for the intelligent, alert man as well as the academician.

The book deals thoroughly, though not completely, with a simple every day fact which confronts thousands of people, in a manner which can be easily understood. It simplifies and clarifies the situation portrayed without making it appear more involved than it actually is, as most books on banking and finance have a tendency to do. It should have a wide audience to profit by its valuable information.

L. J. CHASSEE[5]

Nationality, Color and Economic Opportunity in the City of Buffalo. The Committee on Publications, Roswell Park Publications Fund of the University of Buffalo, in co-operation with The Inquiry, New York, 1927, pages 124.

The author finds: "first, the clear evidence that the negro and immigrant are disadvantaged, as compared with the native white of native parentage: second, the further fact that the negro is more seriously handicapped than the immigrant, the latter is more seriously handicapped than the immigrant, the economic level, while the negro seems still to be confined within narrowly circumscribed limits: third, the existence of striking differences in the economic experiences of the various immigrant nationality groups, although these differences bear little significant relation to the distinction between the 'old' and 'new' immigration: fourth, the importance in and of themselves of the attitudes and emotions of the persons involved in the various economic relations reviewed."

Certainly nothing is more important to the future welfare of our country than a solution of the social problems arising out of race and color, and if we are to reach a solution we must first have a general agreement on the facts. Dr. Carpenter's broad minded discussion of those gathered in making the Buffalo study is of general rather than local interest, and is decidedly a contribution to what has already been said on the subject.

Students of sociology will find some interesting figures compiled and charted.

BRYANT B. GLENNY[6]

The Worker and His Job. Outlines for the Use of Workers' Groups. The Inquiry, New York, 1927, pages 65.

This pamphlet, as the title denotes, demonstrates the technique of holding small informal group discussions with special reference to the needs of leaders of workers' groups.

In a few introductory pages the general plan for development of a successful discussion meeting is summarized as a guide for the group leader. Topics touched on are the initial approach to the subject through personal experiences of group members, bringing out diverse points of view through discussion and reference to written authorities, elimination of personal prejudice, summarizing final opinions of the group and points worthy of further discussion.

The outlines themselves, composing the main body of the pamphlet, illustrate how representative topics on workers' problems could be developed by using these principles. The subject matter of these outlines is most interesting in itself, but, as the introduction states, its main value is as illustrative material for the technique of group leadership. The principles of group discussion exemplified here could be well applied to any type of discussion meeting, so long as the group had some common interest.

A valuable addition to the pamphlet would be a summary analysis of the technique used in the sample meetings outlined in the text, in order to amplify by concrete suggestions the general principles touched on in the introduction. In reading through these illustrative outlines, the reader is conscious that there is a definite technique underlying the presentation of the material and would like, as a summary, a concise list of suggested methods as a guide in developing his own particular group topics.

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